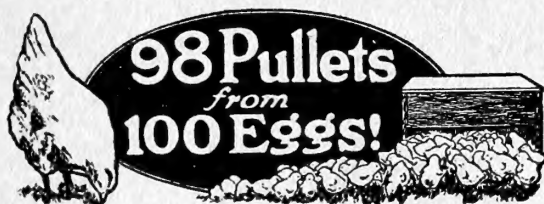


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How to Tell the Sex of an Egg before Incubation and How to Tell the Sex of a Chick when Hatched



Price \$ 3.00

Edited By

T.E. Quisenberry

14-Year Old Girl Cleared \$1592⁶⁵



With Her Poultry in 9 Months

This remarkable record made by a girl only 14 years old who followed my tested and proved methods. What she has done, you, too, can do. Simply follow the secrets I have learned in more than 30 years experience in poultry farming. Read her letter—then send Today for my free book. It will show you how to make more profit in 1921 than ever before.

Your future success—your poultry profits next fall and winter depend upon your success in brooding, feeding and growing chicks now.

T. E. Quisenberry.

**FREE
BOOK
TELLS
HOW**

Read Her Letter

I am one of your Poultry Students. I wish to write you telling you of the many ways in which I have made the price of your instructions. I am fourteen years of age. I started the first of January with 500 White Leghorn hens. I lost 20 before I got your instructions. I lost them by wrong feeding. This year I fed according to your instructions as near as I could. I am sending you the report of my record from January 1st to October 1st. This shows cash income only, as I do not keep a record of eggs consumed at home:

Eggs sold . . \$1,883.10

Poultry sold . . 178.40

Total sales \$2,061.50

Feed cost . . . 468.85

Net profit . . \$1,592.65

VIRGINIA A. KOBE, Missouri

Save Every Chick You Hatch

Every dead chick means a loss of 50c to you. You can avoid the losses that sometimes wipe out a whole year's profit if you know how to prevent dead chicks in the shell at hatching time and how to feed properly for quick and vigorous growth.

Why Take Chances

When You Can Be Sure—

Why guess—why wonder what to do? My methods have proven successful for over 27,000 others in 48 states and 19 foreign countries. They show you how to do, profitably, many things that have cost you money in the past. Don't delay, send for the book today!

Prevent Disease!

This new 100-page book tells you how to prevent baby chick bowel trouble, white diarrhea, etc. Tells you how to care for the chick from shell to early layers. Tells you how and when to get top prices—tells you everything to make you more money from your poultry.

Start Now! Make the

first step toward bigger profits in poultry by sending your name and address today for your copy of this free book. Contains hundreds of money making secrets. Apply them to your own poultry business, whether a large commercial plant or a back yard poultry farm.

**Dollars
and
Sense in
POULTRY
BUSINESS**
by
T.E. Quisenberry

Don't Send a Cent This book is absolutely free without any obligation on your part. Just send me your name and address (a postal will do) and I will send you a copy, prepaid by return mail—Don't put it off. Write NOW!

AMERICAN POULTRY SCHOOL

Dept

Kansas City, Missouri

MAR 21 1921

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THE WHY OF THIS BOOK

There are many devices and ideas being sold on the market which claim to reveal a method of testing the sex of an egg before incubation, or of a chick as soon as hatched. We have tested practically all of these known methods and have found most of them unreliable.

It is only after testing a method that was discovered by Mrs. Noda Fry, of Missouri, that we felt that there was any dependence to be put in any method of discovering the sex of an egg or of a chick. We tested this method for more than a year, and all the tests that we have made have resulted in our belief that Mrs. Fry's method is really reliable and a great discovery worthy of application and further investigation.

In addition to the tests which we made with Mrs. Fry's method ourselves we might state that while attending a poultry show in Chicago a native Hollander came to the educational booth of this School, and in discussing poultry matters asked us why we did not use the method of determining the sex of an egg as used by his mother "in the old country." He stated that she was able to hatch all pullets or all cockerels, whichever she wanted. He freely volunteered the information that she determined the sex by candling the eggs and by examination of the air-cell, and the facts which he revealed to us coincided exactly with Mrs. Fry's theory. He did not know that we were working along the same line.

In order to really tell just where the air-cell is located in an egg, especially in a thick-shelled, dark brown egg, you should have a good candling device. If you have a good candler with a strong light, the eggs can be tested very rapidly. No expensive equipment is required, no loss of time, no freak stunts or fancies, just the plain use of a scientific fact in a "common-hen-sense" manner. Without using this method, eggs ordinarily hatch about one-half males and one-half females. If you only want a large per cent of pullets this method will enable you to market your cockerel eggs and set largely those of the female sex if that is what you wish.

We do not state that this method is absolutely 100 per cent perfect, but if you can save 50 per cent to 75 per cent of your eggs it is a great saving to you. Tests have been made where 96 per cent to 98 per cent of the eggs proved to be true to the sex as determined by candling, and about the same per cent proved true in the sex of the baby chicks when tested by the method illustrated in this book.

We have included other ideas in this volume which we feel will be of equal value to the poultryman who might become the possessor of same. The ideas advanced as to correct methods of hatching, brooding and the rearing of chicks are equally valuable.

For the reason that we are forced to pay Mrs. Fry a large royalty on this book, we are forced to ask the price at which the book is advertised. However, we feel that there are several ideas advanced in this volume, any one of which is worth far more than the cost of the book. We are offering these ideas to the poultry world with the belief that they will be of inestimable value, and you will be personally benefited by same.

AMERICAN POULTRY SCHOOL
KANSAS CITY, MISSOURI

JUN 21 1921

CHAPTER I

Hatching, Feeding and Brooding Problems

By T. E. QUISENBERRY, President

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CAN THE SEX OF AN EGG BE TOLD?

"Can the sex of an egg be told in advance of its development?" This is an old question. It is well not to answer it with a "No," without considering nature's work in the development, not only of the hen egg but other forms of the egg.

It is well known that "eggs breathe" from the time they are laid until they hatch. Then why not the location of that "breathe" space, or the size of it or the shape of it, be the determining factor in whether a given egg becomes male or female?

We also know that during the period of incubation that the embryo or chick rests with its head toward or nearest the air-cell. Then the air-cell must be for a purpose other than for mere space. If the chick develops with the head to the small end of the egg, the air-cell is also found at that end. Then the air-cell must have some influence on the sex and on the development of the chick.

Mrs. Fry claims that the egg which has an air-cell squarely in the large end of the egg will hatch a male if the egg is fertile, and that with the air-cell on the side of the egg will hatch a pullet. I believe there is a reason for this which we will be able to explain later.

My opinion is that the embryo which has the air-cell in the large end of the egg is perhaps furnished with less oxygen or less Carbon Dioxide in development than is the embryo where the air-cell is on the side of the egg. As a rule, the shell at the large end of the egg is thicker and less porous, and less egg-shell surface is exposed to the air-cell than where the air-cell is located on the side of the egg. In other words, in one case or the other the germ is supplied with more or less of the elements needed in its development than it is in the other case, and the sex of the egg is probably affected or determined in that way.

We are told by some of the bee experts that there are certain cells in the hive that have germs in them that will develop drones or workers if they are allowed to remain undisturbed. But if the queen bee is killed or dies for any reason, the bees go to a certain one of these cells, it is opened up and is fed and nourished in a certain way, and instead of that cell developing a drone, as it would if left alone, it develops into a queen to take the place of the one that has reigned previously.

As we state above, take, for example, the simple honey bees and the ordinary ants. Observers and scientists are practically unanimous in their decision that the bees take an egg and develop it either into the male, or drone, the queen, or female, or else the humble worker of neuter sex. This the bees do from the ordinary egg absolutely at will, developing either of the three.

The queen bee lays the eggs. Then the workers by feeding, by manipulating, or other conditions that they make for each individual egg, determine what the sex or want of sex, it shall be.

One observer thinks it is in the feed that they give, using a different kind of feed for each sex. Another observer will contend it is in the size of the cell and confinement. It is claimed by some that by enlarging the cell one egg will develop into a queen or a drone. It is then universally agreed among observers of bees, as well as ants, that the eggs at the start are not fixed as to sex, but the sex is fixed by conditions which the bees

or ants themselves create. Thus sex is fixed by conditions that are controllable.

If, then, the sex of the egg is not fixed at the time of fertilization, but is a matter of condition later on, why could not conditions affect the sex of a hen egg as well as that of the bee or ant? Why could not the shape of the egg and the location of the air-cell—or other conditions—determine sex?

Life is a mysterious thing at best, and there are certain truths which we know to exist, yet we cannot give the reason for them. That is true in this instance, but along this same line some French scientists at present claim that they have developed, or are developing a method of changing or determining sex in animals, including the incubation of eggs, by certain forms or changes of food and nourishment.

We know that a certain amount of oxygen and a certain amount of Carbon Dioxide and of moisture are necessary to the life, growth and development of the embryonic chick. We know that we can increase or decrease our hatches, we can increase or decrease the number of deaths in the shell, by the regulation of the air in the incubator room, of the ventilation in the machine, and of the moisture supplied. Then why would not the delicate, developing embryo be greatly affected by the difference in the oxygen, Carbon Dioxide, or moisture, as affected by the air-cell itself? We believe that this air-cell is for a purpose to which poultrymen have never yet given serious thought, and of which our poultry scientists have not discovered the actual contents of the air-cell during the period of incubation, or its real purpose or value to the developing embryo. When that is known, in our opinion, you will have solved the secret of why one case develops a male and the other a female.

OTHER IDEAS OF TELLING THE SEX OF AN EGG

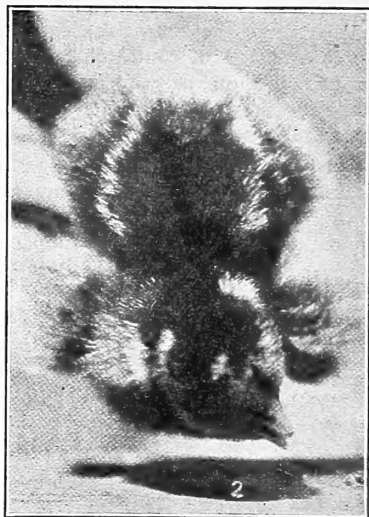
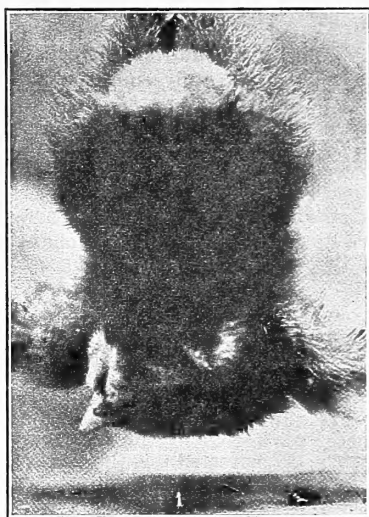
Some claim if you mate a strong, active cockerel with hens that are two to five years old, using about five or ten hens with one male bird, you will hatch from 60 to 90 per cent cockerels. To raise nearly all pullets use an old male bird with twenty-five or thirty-five good pullets. You may not have the highest average fertility, but the chicks hatched will run largely to pullets. Our experience has been that there is not much dependence to these rules. You will get best results if these birds are allowed to have free range.

Some people imagine that by setting round eggs, or those nearly so, they will hatch a larger per cent of pullets. Also, that by incubating only the extra long eggs with wrinkles on the small end of the eggs, that these will hatch cockerels largely. There is no foundation for such a belief. Many fake plans and devices are proposed which are claimed to control sex, influence the hatch and do many other wondrous things. We know that some families in the human race are prone to produce offspring of only one sex. The same is true with your poultry. If you find a male bird or a mating which is inclined to produce a large per cent of the sex you desire, it is advisable to continue this mating as long as the results are satisfactory.

In speaking of this same subject, M. K. Boyer had this to say:

"Referring to the theory that eggs wrinkled at the narrow ends produce cockerels, an English writer says that to the student of embryology this fallacy is at once apparent. For the first few days the chicken is sexual, from then to about the seventh day it is distinctly hermaphrodite, and contains within itself the elements of both sexes. After this stage it diverges in one direction, one set of organs developing and the other diminishing, according to whether the germ is going to produce a male or female. So that if the germ had a living consciousness it would not know at the sixth day which sex it would ultimately be."

TELLING THE SEX OF DAY-OLD CHICKS



Photographs No. 1 and No. 2 show distinctly that the male Silver Wyandotte chick carries more white than the female and usually a distinct stripe on the back. It is interesting to note that chick No. 1 also has a very narrow or small comb, while No. 2 has a comb that measured actually but little less than 3-16 of an inch wide. It is also considerably higher or fuller than that of No. 1.

These pictures were taken for the Reliable Poultry Journal, in such a position as to make plain the difference in shape of comb and the actual size of the comb. These pictures also indicate that the male head is considerably coarser in every way.



FIGURE 3

Figs. 3 and 4 illustrate a method of distinguishing the sex of chicks of any breed.

Fig. 3 shows male chick according to the claims of one informant. The chick hangs limp and does not struggle like the female if held in the same way.



FIGURE 4

Fig. 4. While the male chick if grasped by its feet and held suspended will hang limp or extended as in Fig. 3, the female chick will flutter and draw itself up as in Fig. 4. This method appears to be successful and is worth trying.

There is no doubt about most parti-colored chickens having some color distinction, which if the breeder observes closely will be a fairly reliable guide in the selection of the male and female at the time the chicks are hatched. But in the case of white and solid colored varieties it is difficult to formulate any rule or method which would be anything like correct. In the selection of Barred Rocks, Silver Wyandottes and such varieties the male chicks are always lighter in color than the females. The males have combs which are wider at the base and the leg color of the female is much darker than that of a male chick, as a rule. The legs of the male chick of most varieties are usually a trifle larger and plumper than those of the female. The male chicks almost invariably show more white or gray. The male head is usually considerably coarser. There is no rule which is invariably correct, but these suggestions may prove helpful if the breeder is a close observer."

Mr. W. L. Fry has given considerable study to the question and he states:

"By far the most surprising and interesting theory is one which was first brought to my attention last August. The poultryman wrote: 'My method in telling the sex of day-old chicks is to take the chick by the back of the neck with two fingers and hold it up. A male chick, any breed, will drop its legs and a female will draw them up close to the body.' This seemed so ridiculously easy, almost primitive—that I at once began to make tests and I have been genuinely surprised with the success of this simple method, for it seemed to 'prove up' in a great majority of cases. However, I found it better and surer to grasp the chick by the feet and let it hang down. The male chick will hang limp or extended, while the female chick will struggle and draw the head and body up toward the feet. I tried to photograph some chicks to illustrate this, but the films

were not good. However, the outline sketches illustrated herewith show the method plainly. The man who showed me this method said he used it successfully. My own tests of it this season have failed in only one case out of over thirty chicks under observation. It is a method that requires only an instant of time and no great knowledge or skill. If it works correctly with even 75 per cent of the chicks it is valuable, because the novice can use it as well as the more experienced breeder and it will work as well with one breed as another. Such a method with the added 'check' of comb, leg and head conformation and the color distinction ought to enable any one to tell the sex of day-old chicks successfully."

This method or test for telling the sex of a chick, combined with that of Mrs. Fry's illustrated and described further on in this book, will give you the best known and most reliable method of determining the sex of a chick at hatching time. With a little practice in either testing eggs or chicks you will become more accurate.

WHY CHICKS DIE IN THE SHELL—THE REMEDY

The loss from death in the shell is appalling. There are many reasons for this, but if operators of incubators were acquainted with the essential features of proper incubation it would be possible to hatch chicks with success and without much loss due to the above cause.

1. Consider the parent stock. Are they laying eggs that are capable of hatching strong, healthy chicks? If you are using eggs from pullets that have been forced for egg production throughout the winter, you can hardly expect either the incubator or the hen to hatch a large percentage of strong, livable chicks. If the stock is in-bred, too fat, if the male is over or under mated, or if the stock is poorly fed, you cannot expect good results. The first thing is to be sure that you have strong, vigorous stock, that your eggs are coming from second-year or yearling hens, or from pullets that have laid during the fall and moulted in the winter and begun to lay in the spring.

The breeders must be mature and in good condition. Immature, old, fat, sickly, or lousy stock, or hens that have been forced for winter egg production, cannot be relied upon to produce strong, hatchable eggs. They must be provided with comfortable houses, admitting an abundance of fresh air without draughts. They must be furnished with plenty of pure water and grit, and be compelled to scratch in a deep litter for their grain food. Avoid fattening food and feed plenty of green food. Give all the green food you can get them to consume and compel lots of exercise.

2. Consider the care of eggs for hatching. This alone causes a large per cent of poor hatches.

Eggs for hatching should be gathered frequently, to prevent chilling in cold weather, and to keep the germs from starting to develop in hot weather, or on account of broody hens. Eggs are best kept in a room with a temperature of 50 to 60 degrees. They should be turned daily. If eggs for hatching have been shipped to you, let them stand for twenty-four hours before placing them in the incubator.

Eggs intended for incubation are apt to be addled if roughly handled or if stored in too warm a place, with the result that they are rendered useless for hatching. Eggs placed in rooms containing gas jets or fires are apt to be spoiled, owing to the fact that excessive warmth liquifies the albumen—so much so that the yolks, on whose upper surfaces are the life germs, are not held in the center of the eggs, and the germs are brought into close contact with the membranes lining the shell. The shells being of a porous nature, are but poor guards against the drying influence of the outer air, and therefore the life germs they enclose either become weakened or fastened to them. A fresh egg contains sufficient watery fluid for the needs of the developing embryo during the period of incubation. If, through long or wrong storage, that fluid is reduced by evaporation, it means that the incubator must supply additional moisture; otherwise the embryo will fail to develop, or, should development take place, the chick hatched will be weak and puny. The moisture supply of an incubator is not intended to build up a chick, but its mission is to surround

the egg with humid air, and so prevent undue evaporation of the watery content of the egg.

3. Location of the incubator and incubator room or house. Incubators should not be located in a room or building that is affected by vibration, such as: near railroads, light plants, engine rooms, etc., as often times a slight but constant jar will kill the germ during the process of incubation.

It is possible to operate incubators in any unheated room with a solid floor, provided the temperature does not go below 40 degrees. The best place, however, is in a well ventilated room or building where the temperature is not so changeable. The well insulated incubator is better adapted for running in rooms where the temperature is variable.

Drafts or direct sunlight should be guarded against. The ideal temperature of the outside room is from 50 to 70 degrees. The room should have proper ventilation. When ventilation is faulty it is impossible to have a good hatch, for the chicks will die in the shell. The incubator uses the fresh air of the room, and takes up the oxygen, to supply the growing embryos.

The air of the incubator room becomes foul and filled with fumes, which should not be re-used by the machine. The chicks suffer as would a human being shut up in a room with gas turned on.

4. Improper incubation is one of the greatest causes of death in the shell. This is caused by inexperience in knowing how to operate the machine, or by poor construction of the machine itself.

The eggs may have been chilled by leaving them out of the incubator too long. They may have had too much or too little moisture. The ventilation may have been excessive or insufficient. The air may have been so damp that the air-cell did not dry out sufficiently and the chick drowned in the excessive moisture. The atmosphere may have been so dry that the membrane became dry and hard so that the chicks could not break through it, or the chicks may have had insufficient moisture which caused them to be very small, and in consequence very weak. Many of these things happen under a hen and she fails to get out a good brood, but the number of eggs she fails to hatch does not seem so large as when several hundred go into the machine and more than half of them are left in the tray un-hatched.

The answers to this question are many, and must be indicated by the proportion of dead chicks to those hatched, and the stage of development and condition of the dead chicks. A chick may live up to the twenty-first day, or even twenty-third day, and still not be able to hatch. Because it lives so long is not taken alone as an indication that it was a strong germ, nor the fact that it lived until the end of the period of incubation any proof that it was fully matured. It should be remembered that pipping time, and to the complete hatch of the chicken, is the most trying period in the life of the germ.

At this critical time, if the chick is not fully matured or is lacking in vitality, it cannot successfully break the shell, and many are unable to exert force enough to even pip the shell, while others die in the different stages of exclusion. In such cases there is no possible remedy except to get germs of sufficient vitality and stamina and yolk food of the necessary properties to nourish them, in order to carry them through this critical period. An embryo chick fully or properly developed breaks the shell and leaves it easily. A strong, well ripened embryo is ready for exclusion late on the nineteenth or by the beginning of the twentieth day, and ought to be out and dry by the beginning of the twenty-first. That is, if you have a lot of eggs, they should begin to pip by the last part of the nineteenth day.

The greatest number of deaths, as a rule, take place on the 4th, 5th, and 6th days, and again on the 18th, 19th, and 20th days. It is said that 65 per cent of all the mortality in the shell occurs during these six days of incubation. The remaining 35 per cent of the mortality is distributed over a period of fourteen days of incubation. The critical periods appear to be exactly the same in the case of either artificial or natural incubation. The period of greatest death in either case coincide.

It may be that the turning of the eggs on the third day has something to do with causing the high mortality on the 4th, 5th, and 6th days following.

5. The traying and turning of eggs will depend on the make of incubator. Some machines have self-turning systems, some of which are very good, but hand turning will give better results and will not jar the eggs as much as in using turning devices. Some machines have a slat running under the eggs as a means of turning which will often jar the eggs and kill the germs and will leave them standing on ends, while others use a rocking device which keeps the eggs set on a 45-degree angle, having them trayed with the little end down. In using the slat system it is necessary that the operator remove the trays after turning, and level the eggs, placing them all on their sides. If they were allowed to stand on end in these particular makes of machines, the germ would stick to the shell causing death. The rocking device does not offer enough or sufficient turning of the egg to insure an excellent hatch.

The usual method of procedure is to begin to turn the eggs for the first time on the morning of the third day, and to cool for the first time on the sixth or seventh day. This cooling and turning is continued until the end of the eighteenth day at which time the doors are closed, and not opened again until the end of the hatch. Unless the eggs are turned occasionally, there is danger of the yolk and germ sticking to the shell. The shell being porous, the tendency to adhesion increases. Turning also moves the embryo in the egg so that different positions are assumed by it. This lessens the chance for crippled and deformed chicks at hatching time.

You can reduce the number of deaths in the shell on the 4th, 5th, 6th, and 7th days of incubation by being very careful in turning the eggs at that time. When the embryo is just beginning to develop it is very frail and a sudden jar or rough handling of the eggs or egg tray is certain to cause a number of deaths. Instead of turning the eggs twice a day from the 3rd to the 7th days of incubation, I would recommend turning them only once on these days and be very careful to see that the eggs are handled with absolute care. The percentage of deaths on the 4th, 5th, 6th, and 7th days can be reduced if this method is pursued.

The eggs are not to be turned the last three days of the hatch—that is, the day before the eggs should pip, in order that the chicks may have better opportunity to get their heads up. When the turning has been discontinued in time, the first crack in the shell will appear on the top side of the egg.

It seldom pays to try to aid any of the chicks in getting out of the shell. Most of them will be cripples even if they get out. If many fail to get out of the shell, conditions are wrong somewhere and you had better investigate.

On about the eighteenth day of incubation the chick begins to get itself into a position to pick its way from the shell. On about the nineteenth and twentieth days you will notice that some eggs are pipped and the shell partially broken. If the eggs are turned after the chicks begin to work their way out there is great danger that the chick will dry and stick to the shell if it is forced to turn over and start a new opening. Therefore, quit turning on the seventeenth or eighteenth day, close the incubator door, watch the temperature, but do not disturb the chicks or eggs.

6. Proper temperature insures better protection against death in the shell. The machine should be regulated before setting the eggs. An even degree of temperature is all important. If the temperature was to run to 110 or drop to 90 degrees and remain so for a period of 12 to 18 hours after incubation had begun, this would either chill or cook some of the eggs, therefore causing death of the germs.

Excellent hatches have been secured by running the temperature the first week at 102 degrees, the second week at 103 degrees, and the third week at 104 degrees, with the temperature running up to 105 degrees at hatching time. This gradual increase in temperature is due to the

fact that as the germs develop they begin to generate animal heat of their own, the amount of heat increasing as the embryos grow and hatching time approaches.

The germs are most delicate during the first week of incubation, and every effort should be made to maintain proper temperature during that time. After the twelfth day, if by accident the temperature goes as high as 110 degrees or as low as 85 degrees, it will not necessarily spoil the hatch, if not prolonged. If the eggs are found to be too hot, take them out and let them cool down to 90 degrees, allowing the incubator to stand open meanwhile.

A uniform temperature of as nearly 60 degrees as possible has been found to be best for the room in which the incubator stands.

With the correct thermometer hanging in the correct position and kept at a uniform temperature, the eggs may not have imparted to them the right number of heat units in 20 days, by reason of improper handling on the part of the operator.

Heat units are those by which heat is measured. A certain number of heat units are required before any chemical change can take place in a body of matter. Motive force is produced by heat units. Before the embryo can develop enough strength to free itself from the shell, it must absorb a certain number of heat units. If the chick is to hatch in 21 days, it must absorb just enough heat units to make this possible in that length of time. If the required heat units are not there to be absorbed the hatch is prolonged beyond the correct period of incubation and the embryo is weakened and perhaps cannot develop life and power enough to exclude itself from the shell. If the temperature is kept too high, too many heat units are absorbed and the chick hatches too soon, or may be killed by the bad effects of the excessive heat units.

7. Development of the air-cell is also an important feature. The evaporation of the moisture within the shell is constantly going on which increases the size of this space. This air space is necessary, and should it, at the end of the incubating period, be very small, it would indicate that too much moisture has been supplied. The chick has no room for breaking the shell and the egg is so full of moisture that it either drowns in the shell, or, if it manages to get out, it is covered with slime. When the egg is first placed in the machine, the air space is about an eighth of an inch; on the third day it will be about one-fourth of an inch; on the eighth day it will have increased to about three-eighths, on the fifteenth day it will be about five-eighths of an inch, and on the nineteenth it will be about three-quarters of an inch. The air penetrates the shell and takes the place of the dissolving liquid.

8. No problem connected with the subject of incubation is more complex or less understood than the moisture problem as related to the artificial incubation of hens' eggs. The opinions of incubator manufacturers differ vastly regarding it. Scarcely two experienced operators can be found who are agreed on the subject. These widely varying opinions are undoubtedly due to the fact that the amount of moisture needed in order to bring off a successful hatch depends upon conditions, and varies as greatly as do the opinions regarding it. In view of this fact, the operator must always make a careful study of the conditions under which his incubators are running, as well as to their requirements of developing chicks, and then fall back upon his own judgment and common sense.

The nearer the hatch, the more oxygen needed, and some then ask why we recommend closing the ventilators at that time. By closing the ventilators we mean only those at the outlet and not the intake. At this time you must retain the moisture in your machine. If there is an abundance of fresh air in the incubator room, the closing down of the ventilators which control the outlet will in no way injure the hatch, but will retain the moisture which is needed at that time. If the ventilators on both the intake and outlet are open during the last days, no moisture will accumulate on the glass of the incubator door, which shows that there is a lack of moisture in the machine. The best hatches,

as a rule, are those where at least a slight accumulation of moisture can be seen on the glass in the egg chamber. You must have an abundance of oxygen, but you must also prevent the eggs from drying out at hatching time.

In general the amount of moisture which will be required to sufficiently check the evaporation of the contents of the eggs in the incubator depends:

(1) Upon the temperature of the air in the egg chamber. The warmer the air the greater will be the evaporation and vice-versa.

(2) Upon the rapidity with which the air is passing through the machine. The faster it moves the greater will be the evaporation, and vice-versa.

(3) Upon the proportion of moisture which the air holds when it enters the incubator. If the air is dry as it enters the machine, the amount of evaporation through the porous shells of the eggs will be much greater than it will be if the air is already laden with moisture.

In view of these facts it will be readily apparent that the amount of moisture which should be supplied will naturally be much less if the incubator is being run in a damp cellar than if run in a dry room in which is a stove, or a dry basement in which there is a furnace. It will be less in the spring, when the weather is inclined to be damp, than it will be in the hot, dry spells of summer. The amount of moisture which should be supplied will be considerably less in damp climates than in the hot, dry regions of Arizona and New Mexico. Thus one must be continually on the lookout, and studying daily conditions, as well as the peculiarities of the particular make of machine which he has. Under some conditions it will be necessary for you to supply extra moisture, and under others it will not be necessary. If the air-cells in incubator eggs are small, evaporation is not taking place rapidly enough, and steps should be taken to increase the movements of the air through the machine.

If the incubator room has a concrete floor and the general atmospheric condition is quite dry, take a hose and turn the water on the floor until it is thoroughly wet; or, take a large sprinkling can and thoroughly sprinkle the floor each night and morning. In such a room it dries out slowly, and enough moisture is supplied for good results without applying it directly to the eggs in the incubator chamber. In ordinary weather, when the ground and the atmosphere contain a reasonable amount of moisture, it is not necessary to supply an additional amount, as a rule. It is not necessary to add moisture to the machine in rainy seasons or when the air is laden with moisture.

It is just as important, and in some cases more so, to have moisture in the air in your incubator room than to have it inside of the machine. If the air in the room contains considerable moisture there is not so much danger from the lack of moisture in the egg chamber. That is why you should sprinkle the floor once or twice a day, if you have a concrete floor, or keep moist sand beneath the incubators. If you use sand in the tray of the incubator or the incubator room it must be kept moist. If you allow it to become dry it absorbs the moisture in the eggs and in that case is more detrimental than helpful.

If too much moisture is used and the contents of the egg are not properly dried down the chick will be so large that it cannot turn in the egg and free itself at hatching time.

People do not seem to realize that an egg contains excess moisture, which must be gotten rid of if a good, healthy chick is to result. If the water is not gotten rid of, it enters into the body of the chick making a large, weak, flabby chick, which, even if it does hatch, will never do well, and at the same time reduces the size of the air-cell, and consequently the breathing capacity of the embryo.

9. In some instances carbonic acid gas (carbon dioxide), due to improper ventilation of incubators, is a common cause of chicks dying in the shell. Investigations and tests show that carbonic acid gas, when moisture is present, has a decidedly decomposing effect upon the egg shells, thus helping to release the chicks. The results of these tests

lead to the conclusion that when weak chicks die in the shell it is not because of excessive amounts of carbonic acid gas. But, on the contrary, death in the shell may sometimes be due to the lack of sufficient carbonic acid gas to decompose the shells.

Tests were made to compare the carbon dioxide under the hen and that of the incubator. The experiments indicated that the hen gives off a great deal of carbon dioxide from her body. It was proved that the growing embryo gives off much carbon dioxide and is a chief source of carbonic acid gas in artificial incubation.

10. The growing embryo must be supplied with oxygen during the period of incubation. But it is possible to supply more air than is necessary, especially during the first half of the incubation period. This is especially true if the temperature in the machine should run too high.

Too little oxygen causes too rapid development of the heart, and the heart is forced to beat so rapidly in order to supply the embryo with sufficient oxygen that it results in hemorrhage, which is shown by blood rings in the eggs where the germ has died. If an egg is opened only a few days after incubation has started, the heart of the embryo can be seen beating, forcing blood to all parts of the egg to nourish the developing embryo.

During the second week the chick needs a large amount of blood, which calls for a large supply of oxygen. The third week there is a call for still more oxygen, for large quantities are needed to develop the rapidly growing embryo.

11. Darkness is essential at hatching time. Darken the glass of the incubator door by placing a cloth over this glass. This does not admit any light into the egg chamber and therefore the chicks will not crowd forward to the light. It is perfectly natural for the chicks to come towards the light and in doing so they move the eggs around, oftentimes turning them completely over, and in some cases cause the chicks that haven't hatched to die in the shell. If the door is darkened, the chicks remain quiet and contented.

The chick pips at the top of the egg and if this pip is turned over the chick stands on its head and as a result will drown; also this will delay the hatch of the chicks that are partly out, causing them to hatch late and the outcome is weaklings. By darkening the door, when the chicks break out of the shell they stay in the same place and do not move around a great deal.

All of these conditions depend largely upon the operator, and by careful attention and study he or she can prevent mortality in the shell and get much better hatches.

Summing up all of the direct and indirect causes of mortality in the shell during the stages of development of the embryo we have:

1. Improper care and selection of the breeding stock.
2. Faulty handling of eggs before incubation.
3. Location of the incubator and the incubator house.
4. Ventilation of the incubator room.
5. Improper incubation.
 - a. Insufficient turning of the eggs.
 - b. Proper time to turn eggs.
 - c. Cooling of the eggs.
 - d. Development of the air-cell.
 - e. Correct temperature of the incubator.
 - f. Excessive or insufficient moisture.
 - g. Liberal supply of oxygen in the egg chamber.
 - h. Lack of carbonic acid gas.
 - i. Proper time to quit turning the eggs.
 - j. Lack of moisture at pipping time.
 - k. Darken the egg chamber at hatching time.

Thus in 21 days we see an edible egg transformed into a living, movable object composed of flesh, blood, bone, and feathers. Such a transformation taking place so rapidly, you can easily see, makes growth so rapid that many things can easily happen to cause death in the shell

while the embryo is in this delicate and rapidly growing state. That is why such a large per cent die during incubation.

PROPER METHODS OF BROODING

Methods of Brooding in Long Brooder Houses.—The original method of supplying heat to the chicks in long brooder houses was to run hot water pipes about eight inches above the heads of the chick, the entire length of the house. These pipes are boxed over, making brooding compartments from three to five feet square. This method of warming and hovering chicks in long brooder houses has never proven entirely satisfactory, even under the most favorable conditions—largely because it has been impossible to properly control the temperature.

The second and more successful method of brooding chicks in long brooder houses is also by means of hot water. The pipes, however, run underneath the brooding compartments instead of above them. The pipes are carefully boxed in, so that the brooding compartment floor is never heated, thus preventing leg-weakness. In each compartment a hollow metal drum extends down to the hot water pipes. This drum, which is perforated around the top so as to let the hot air from the water pipe into the brooding chamber, extends about eight inches over the chamber floor. On the drum is placed a movable circular hover with a "slit" curtain extending all the way around it. Thus we have an ideal hover, serving the same purpose as the portable sanitary hover.

The third method of hovering the chicks in a long brooder house is by the supplying of individually heated brooders or hovers. Where a large number of chicks are to be hovered, this system has little to recommend it. In order to provide proper conditions an extra heated system is often required in order to keep the building warm enough, while entirely too much time and labor is required in caring for the individual lamp and hovers to make the system an economical one.

The fourth system of hovering chicks is to let them live as Nature intended them to live and come up in the fall, strong, healthy and vigorous, ready for the battle of supremacy in egg-laying contest or show-room. Each spring the colony houses should be placed on fresh ground so that there will be no danger of infection from the previous season. One of the most common causes of contagion and resulting failure in the poultry business is allowing the young chicks to use the same runs year after year. The colony house effectually does away with this trouble.

Colony houses are made in an endless number of sizes, shapes and styles. Some are as small as 3 by 5 feet, and are commonly called "outdoor brooders." These outdoor brooders are built warm and snug, and are equipped with lamp-heated, portable hovers. Several incubator companies manufacture and sell outdoor brooders. While they have points of merit, yet their rather high cost, coupled with the fact that they can only be used for a comparatively short time each year, render them less practical and economical than the larger colony houses.

Comprehensive experiments have been conducted by the American Poultry School for the purpose of determining what size and type of colony house was best adapted to meet the needs of the average poultryman. As a result of these tests, the Farmers' Fool-Proof Colony House, described in the lesson on "Poultry House Construction," was found to be among the very best. This house, 8 by 12 feet in size, can be divided through the center, two hovers put in it, and two hundred chicks comfortably housed. Later the cockerels can be culled out, and the pullets housed in it until they are practically mature. It is large enough so that a flock of twenty-five or thirty laying hens can be kept in it all winter. If you use a portable colony house it should not be larger than 8 by 12 feet. If the house is to be stationary, we would build it 10 by 12 feet, or 12 by 12 feet.

In long brooder houses the use of fireless brooders is no longer practiced to any appreciable extent. Repeated experiments have proven beyond the shadow of a reasonable doubt that little chicks must have some artificial heat during the first few weeks of their lives, unless the climate or the weather is quite balmy.

Colony Houses.—For the average small poultryman the colony brooder house, with the portable sanitary hover, comes nearest to solving his brooding problems. The beauty of colony houses is that they can be used practically the year around. The chicks can be placed in them as soon as they are hatched, and kept there until they are mature. Colony houses are inexpensive. You can start with two or three, and build more as your business grows. They can be moved about from place to place, an advantage in many ways. In early spring, while the chicks are little, the colony houses should be placed close together so that the distance traveled in caring for the chicks will be as small as possible. As soon as spring opens up, and the chicks no longer need their hover, the colony house should be dragged out along the orchard, oat, wheat and corn fields, etc.

Figure 104 shows two colony houses that have been placed end to end. These houses are in use on The American Poultry School's farm. These should be placed as close together as possible and a passage-way

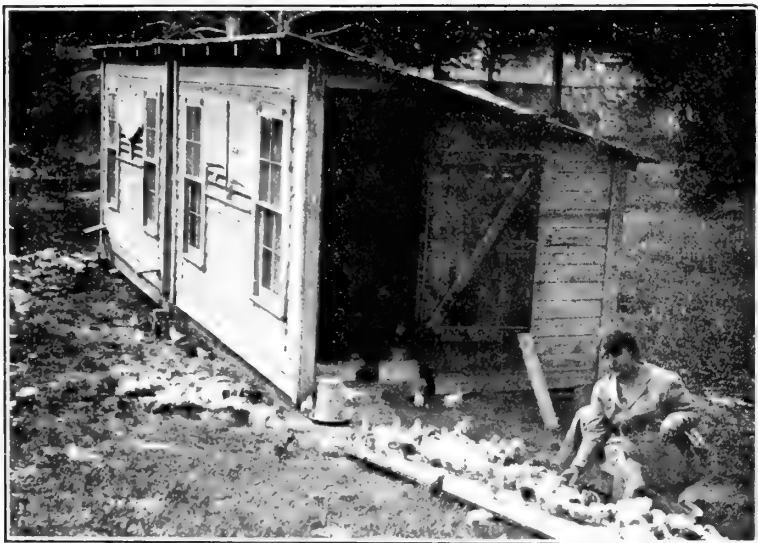


FIG. 104

made from one to another. It is a good idea to make this opening as long as possible and about a foot high. Cover it with boards and roofing material so rain cannot beat in. The stove can be placed in one room and the other used for feeding and exercise. We would not advise building colony houses to use in this manner, but if you already have the houses they can be converted to good use in this way. If we had to build new houses, we recommend the double-room house in preference to the colony houses, or one large room 14, 16 or 20 feet square with the brooder stove in one corner or in back of the house.

THE DOUBLE-ROOM BROODER

A modification of the long brooder house, and one which is far superior to it in my opinion, is what is coming to be known as the "double-room brooder." The double-room brooder, as the name indicates, is merely two rooms from 10 to 14 feet square, with a specially constructed stove in the center of one room. The house should have a partition in the center and the stove on one side unless the room is 14 to 20 feet square. In that case a stove can be used in each room by placing it in

one corner or near the rear. Various styles of these stoves are now manufactured, some burning kerosene and some using fine bituminous coal. These stoves are so constructed that they reflect the heat outward and down to the floor. The chicks merely gather round the stove at the distance from it where the heat makes them comfortable.

From 250 to 1,000 chicks are kept in one of these double-room brooders. This system of brooding is sometimes referred to as "the poor man's friend," because both the housing and the labor cost a mere fraction of that required where the long brooder house is used. Tests thus far made indicate that the double-room brooder is a decided success where the chicks are intelligently cared for and the surroundings kept in a sanitary condition. A double floor of matched lumber, with building paper between, is advisable. Abundance of light should be provided by means of windows and openings on the south side. The stove should be kept warm enough so that the chicks will not gather nearer than two feet of the stove.

A litter of fine-cut clover or alfalfa hay, or straw, about two inches deep, should be kept on the floor, and some good commercial chick feed scattered in it daily. This keeps the chicks busy and happy, and is one of the secrets of the successful keeping of a large number of little chicks together. The space surrounding the brooder stove itself should be covered with sand as a precaution against fire.

While the double-room brooder is a recent innovation it is no experiment. This system is of inestimable value to the commercial poultryman who wishes to renew a large flock of laying hens each year, or to produce broilers in large numbers.

Figure 105 is a ground floor plan of a two-room brooder house. This is the ideal house for a coal heater or oil heated stove. The stove should be near the center of the heated room. Boards should be placed around the wall of this room to protect the chicks from cold and drafts, and across the corners so there will be no sharp corners for them to crowd into. You will note that the door in the partition swings both ways, and the board near the floor is for the free passage of the chicks. We recommend the use of sand on the floor of the room in which the stove is located, and straw litter or clover chaff in the cool room. The drinking pans should be raised a trifle from the floor so trash cannot be scratched into them. This method of brooding affords ideal conditions for the chicks. Two hundred and fifty to seven hundred and fifty chicks kept under such conditions will do equally as well, or if properly fed and looked after will lose even a less per cent than where they are brooded with hens. If the rooms are 14 feet square or larger, a brooder stove can be used in each room. Where you use a brooder stove in each room, place the stove in one corner or at the back of the room.

Figure 106 shows the partition wall of a two-room brooder house. The door for the attendant should be on double-acting hinges so it will swing either way and always come back into position. The bottom board nearest the floor should be hinged so that it can be raised and fastened up. This permits the chicks to pass into the cool room, to get away from the heat and to eat and exercise. This door should be just as long as the space will permit. If just a small opening is made for them to pass through, they are too apt to remain in the cool room so late in the evening when they are busy eating that dark comes on and they cannot or do not find their way back to their warm quarters. The result is that they pile up in a corner and some chill and others are smothered. But with the large opening near the floor this trouble is overcome.

Figure 107 shows a cut-away section and an exterior view of the two-room Fool-Proof Brooder House. This house is also used as a growing house for the young stock and for laying pullets in winter months. You can see how the stove is placed and you will also notice the boards around the room to prevent square corners and drafts. It is difficult to improve upon this system and we recommend this sort of an arrangement, feeling absolutely confident that you will be pleased with the results.

Experience has proven that this type of building gives satisfactory

service when brooding chicks in large numbers. Note that it is divided into two rooms. The brooder is installed in one room and the other is used as a cooler, feeding and exercising room. The building should be well ventilated and in addition to the openings in the front a small window should be placed in the rear of each room.

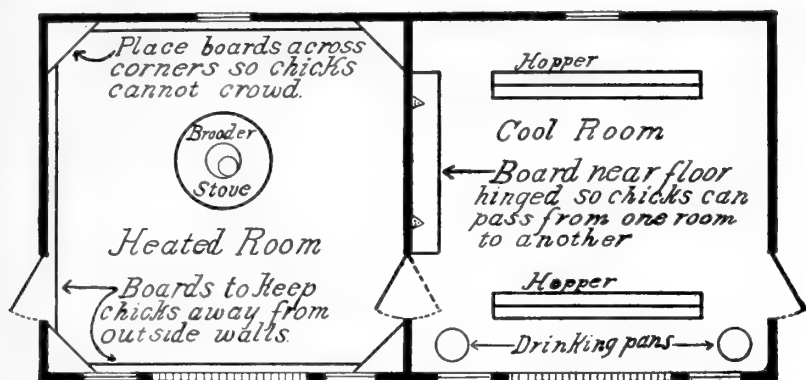


FIG. 105

But a larger heater should be placed in the center of the room, with the deflector sufficiently high to "spill" the heat over almost the entire floor so the chicks may spread out. This leaves little, if any, room for exercising and chicks will not thrive if confined exclusively to this room with the temperature of almost the entire floor space remaining constantly at the same degree.

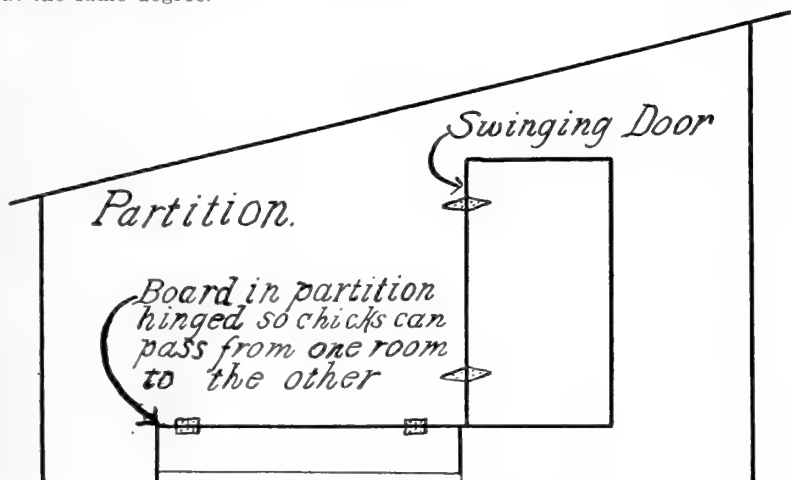


FIG. 106

A large flock necessarily requires the heating of a large floor space to a correct brooding temperature. It is the size of the heater and not the deflector that determines its ability to "deliver heat." No small brooder will do this. If a small heater is used, even though it has a large deflector, it is evident that only a small circle around the stove is uniformly heated. This would make it necessary for the chicks to "crowd" and "pile up," because there would not be sufficient room under the hover for all of them. This is especially true as they grow older and larger.

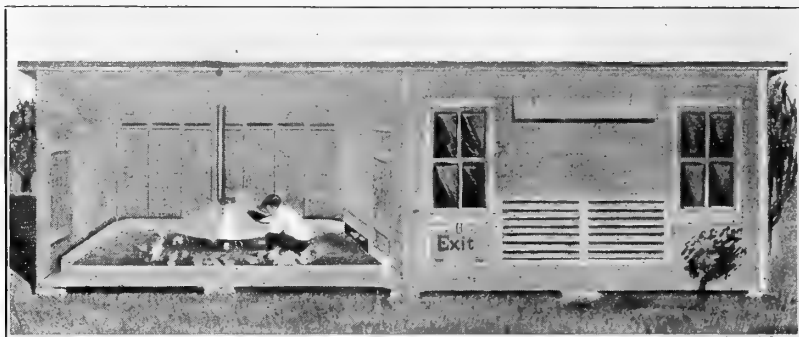


FIG. 107

Being forced to remain in the constant brooding temperature has a tendency to sap their vitality and prevent development into big, sturdy chicks, full of vim and vigor. Strong, healthy growth is encouraged by permitting the chicks to pass to the cooler exercising room and back to the brooding room whenever their natural instincts dictate. The cooler room is, of course, not so essential in the warm months when outside runs are provided.

PARTITIONING THE ROOM FOR DIFFERENT AGED CHICKS

Where chicks of several different ages are to be brooded about the same stove it is best to separate each age by a wire partition. If the stove

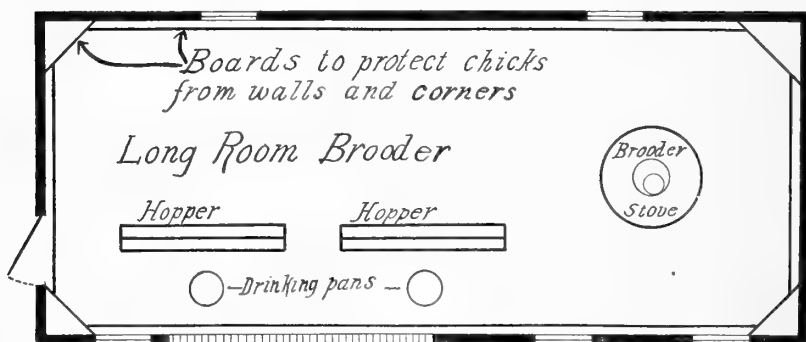


FIG. 109

is in the center of the room you can run one-inch mesh poultry netting, two foot in height, from each corner of the room and let it center at the stove where it may be attached. The wire is high enough to keep the chicks apart, but the attendant can step it with ease. Chicks that are just



FIG. 108

hatched may be put on one side and chicks that are two weeks old may be on the opposite side of the wire, but all brooded by the same stove.

We have had as many as four ages of chicks partitioned off in this way and all using the same stove. Partition your room so all chicks will have access to about the same warm and cool space. This sort of an arrangement saves labor, saves equipment and saves space. It also protects the younger chicks from being run over and injured by the older ones.

Figure 109 is a long, narrow room, or rectangular room used for brooder stoves. In case you wish to use the stove in a room of this kind, place the stove in one end. The other end of the house is always more or less cool so the chicks can have the advantage of different temperatures. It would be a mistake to place the stove in the center of a room of this shape.

Figure 108 is a square room that is used for brooder stoves. In case we used a room of this shape for brooding we would place the stove rather to one side or in the corner. Then the opposite corner and the front of the house would be cool. Place boards across the corners and around the wall so that the chicks will be protected from any possibility of a draft and from the cold walls.



FIG. 101

TEACHING CHICKS TO ROOST—PREVENTING SMOTHERING

Figure 101 represents a very important device which should be used by every poultryman about the time that he takes the heat away from his young chicks and wants them to learn to roost. If the chicks are allowed to roost on the floor after they reach a certain age they crowd and the weaker ones are tramped on, and they often die by the wholesale. Colds and roup and other diseases sometimes follow. But if every poultryman will build temporary roost poles like these and cover the runway up to the roosts and the underneath side of the poles with one-inch poultry netting the chicks will soon find their way to the roosts and will take delight in roosting there, the proper distance apart, instead of crowding and dying in the corners upon the floor. These poles must be made just to fit the end of the house where you want the chicks to roost, so the chicks cannot drop down between the roosts and the house. Make them about a foot or eighteen inches from the floor and with a slanting runway to the first pole. The underneath side of the whole thing must be covered with the wire. This also protects the chicks from the droppings. They simply pass through the wire to the floor, then dry up and are more easily cleaned from the floor than where the chicks have trampled in them. Even if the chicks should crowd on the wire and on these temporary roosts and the weaker ones are underneath, they can still breathe and will not smother as they often do, for the reason that the wire below them permits them to breathe from below, even though other chicks may have them covered from above.

But you will find that the chicks soon take to these temporary roosts. This insures plenty of roosting room for each bird; they grow rapidly and their plumage is kept clean and they keep in good health at a very critical time. No time is so dangerous as when you take the heat away and are trying to teach the chicks to go to roost. This temporary roosting device solves that problem. It educates chicks to roost, prevents smothering, and increases health and hastens development.

Figure 112 shows a temporary wire, of one-inch poultry netting, which surrounds the brooder stove in a circular manner. When the chicks are very young the wire is drawn up in a small circle so that the chicks will be confined within a reasonable distance of the stove and not permitted to get off into one corner of the room and become chilled. It is necessary, however, to have the wire far enough from the heat so that the chicks can get away from same in case the stove becomes overly heated.

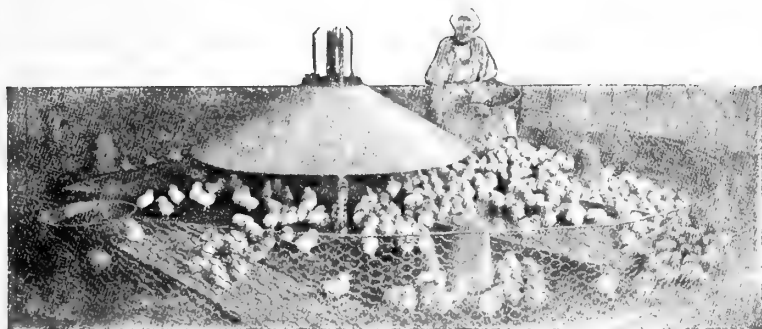


FIG. 112

The ends of the wire are lapped over each other so that the circle can be enlarged as the chicks grow older. Then the wire is finally removed from the room entirely until a new bunch of chicks are hatched and placed about the brooder.

OUR RECOMMENDATIONS

First.—We have endeavored not to illustrate or mention any method which is not reasonably practical and which has not given reasonably good results.

Second.—Where large numbers of chicks are to be brooded upon the general farm or commercial poultry farm we would recommend colony brooder stoves. At the present time we much prefer them to any other system of brooding.

Third.—In using brooder stoves we recommend the stove being placed to one side or one corner if used in a single room.

Fourth.—If chicks are to be brooded on a city lot or in a small way, heated portable or movable hovers are excellent and give entire satisfaction. We think they entail too much work if chicks are to be raised in large numbers.

Fifth.—Chicks can be brooded in fireless brooders or with the mother hen, but we recommend the systems mentioned above in preference to either of these methods.

Sixth.—Any of the heated portable or movable hovers which are manufactured by the better incubator or brooder companies we recommend.

Seventh.—If you wish to use an oil stove we think you will find the Sol Hot Burners, Newtown, Reliable, Kresky or Simplex some of the best. Where coal can be procured we especially recommend the Buckeye Standard stove, the Prairie State Junior, or if you wish a stove of large size the Newtown, McKay, Blue Hen, Candee or other similar reliable makes will be found very satisfactory. In fact any of those which we have mentioned have given splendid satisfaction upon our own farm.

Eighth.—We have had very good success with the long pipe brooding systems. This kind of equipment is very expensive and as it can be used only during the brooding season we would not recommend that method especially for the average poultryman. Where the brooder stove is used it can be removed and the house made use of throughout the year.

Ninth.—It behooves every poultryman to use such methods in raising his stock as will insure the lowest per cent of mortality and the quickest growth. Brooder stoves of many kinds are upon the market and several of these give excellent satisfaction. We know of some who use two of these stoves of small size in one room. Then if one stove goes out, the other will protect the chicks and prevent chilling. For this method of brooding we build a house 10 x 20 feet or 12 x 24 feet. The house has a partition in the center with the board nearest the floor on hinges so it can be raised as a runway for the chicks and a swinging door for the attend-

the opposite side is used for feeding and exercise. It is necessary to have ant. The stove is placed on one side of the partition and the cool room on a cool room—or a cool spot in the room if a single room is used—so the chicks can get away from the heat. This is one of the secrets of successful brooding. Or you may use one room that is long and narrow. Place the stove in one end and the other end remains cool.

The houses for these brooder stoves are built just as we would build any laying or breeding house. We would not build a special brooder house which we could only use three or four months during the year and then let it remain idle for the remainder of the time. Every poultryman should endeavor to have as little equipment as possible. We locate buildings where the chicks can have plenty of range after they grow up, as soon as they are old enough to do without heat. We simply remove the brooder stove and put in temporary roosts. The chicks remain right in this house until next fall or winter when it comes time to cull them and to select the choicest for the laying and breeding pens. A flock of pullets are usually wintered in these houses. Nests can be put in temporarily until the houses are needed again for next season.

By handling the chicks in this way you avoid handling them so often, they become accustomed to their quarters, you do not check their growth by moving, and you are getting the benefit of your equipment throughout the year. It is easier and better to move the stove to another house than it is to move the chicks and have the house vacant for eight months. We know of one party who lost an entire flock last year simply because they crowded as the result of being moved six times, contracted colds and suffered in other ways.

Tack cloth over the ventilators and make the house comfortable and provide for ventilation near the floor, but avoid drafts. Be certain to provide for one cool room or a cool space in your brooder room. If the chicks have a tendency to cannibalism and pick at one another's toes, paint the window panes with a bluish or whitish frosting. This dulls the light so the chicks do not get started picking at one another's toes, wings or vent. You want light in your brooder house, but not the direct rays of the sun. Keep the chicks busy and active. Put some fresh earth on the floor in one corner of the room.

TO PREVENT TOE PICKING

If they show signs of developing the habit of picking at one another, grind some lean meat and mix equal parts of bran, shorts, corn meal and ground meat with a little water, just to moisten it a trifle. After it is mixed run it through a sausage mill or meat grinder and then feed it to the chicks every day. The frosted windows will do most to prevent cannibalism. Where a chick once has the toe torn it is practically impossible to prevent them from picking it further. It is best to remove the chick and keep it in a separate place. If you cannot remove the injured chick, tie up the toe, dipping it first in tar, or some good disinfectant.

Give lots of succulent, tender green food. Give the chick range if possible. If you can keep your chicks busy they will not develop this habit. It is when they are standing around with nothing to do and when the ration is lacking in meat food that they develop this habit. As soon as you see the first indication of this trouble tie pieces of tough lean meat on the end of strings. Let them hang down from the ceiling and just high enough from the floor so the chicks will keep busy working at the meat. They will soon forget to pick at one another's toes, wings or vents.

OUTDOOR RUNS ESSENTIAL

Chicks cannot be raised successfully if kept on a board floor or confined to a building for a great length of time. Outdoor runs should be provided and the chicks should be permitted to get out on the ground for a short while even on rather cold days. On stormy days the chick doors and windows should be opened slightly so as to provide an abundance of fresh air. They must have green food, have exercise, kept off of board and concrete floors as much as possible, and get their feet on the soil occasionally or they will develop leg-weakness and break down.

Close dead air and lack of exercise will kill more chicks than any other one evil. Fresh air is a life saver. Many poultrymen nurse their chicks too closely and many of them are killed because they are not hardened to or permitted to enjoy outdoor runs.

KEEP THE QUARTERS CLEAN

If sand or soil is used on the floor in which the brooder stove is located you usually get better results than where straw is used in your brooder room, or some other form of litter. But whatever is used it is necessary to keep the chicks' quarters clean. If filth is allowed to accumulate trouble will result sooner or later. The quarters must also be kept perfectly dry. If small runs are used remove to the new runs often. It is a good idea to plow up and disinfect the old ground by stirring in air slacked lime. Plant the runs to wheat or oats or sweeten the soil by growing some other form of green food and this also furnishes a fresh crop of green food for the chicks.

THE SECRETS OF SUCCESSFUL BROODING

A cool room is necessary, or at least one portion of the room in which the brooder or brooder stove is located must be cool. Chicks will dwarf and dwindle and high mortality will result if the baby chicks are forced to remain in a heated room continuously.

In the brooder room or surrounding the brooding device a reasonably high temperature must be maintained in order to keep the chicks from piling up and smothering the weaker and smaller ones. If a reasonably high temperature is maintained and the room is comfortable the chicks will spread out and loss will not result.

Where chicks are brooded in large numbers in one room or brooder there is a great tendency to toe picking and cannibalism. If the windows which admit light are slightly stained or frosted so as to deaden the light this can be avoided to a great extent. What is required in an ideal brooder house or room is light and not the direct rays of the sun. When this habit is once contracted it is hard to overcome so see that your windows are frosted or tinted as suggested.

To grow into a really valuable specimen a chick should be kept growing continuously from the time it is hatched until maturity. To grow chicks that will mature into a fowl which you will be proud to own requires intelligent care throughout the brooding period. There is no half way place, no period when careful attention is not required and no time when haphazard methods will fit in.

STARTING THE CHICKS

Transferring to the Brooder.—About forty-eight hours after the chicks begin to hatch they should be ready for transferring to the brooder, and the brooder should be warmed up, regulated, and ready to receive them. The best time to transfer the chicks is in the morning, so that you will have that day to watch them, see that they get used to their new quarters, and that all conditions are favorable. In transferring do not give the chicks any possible chance to become chilled. Do the work quickly. Place them in warm cloth-lined baskets and put cotton flannel or some other warm cloth over them while carrying them to the brooder.

In Their New Home.—If there has ever been any trouble with white diarrhea, the chicks should be allowed to drink a little sour milk or buttermilk just as soon as they are put in the brooder—just a few swallows, not all they can drink. The chick will usually start drinking right away, if you stick its beak in the milk, so as to give it a taste. It has been found that sour milk or buttermilk contains lactic acid and that lactic acid seems to be sure death to *Bacillus pullorum*, the germ which causes white diarrhea, or at least prevents its growth. This simple home remedy has proven more efficient in combating this scourge than most of the expensive advertised remedies. It also seems to sharpen the appetite and promote the growth of the chicks. If you do not have sour milk or buttermilk at hand, or do not consider it necessary to use it, give the chicks a drink of lukewarm (not cold) water when you place them in the brooder;

after this they should be placed under a hover and allowed to sleep and rest for a couple of hours before they are given their first feed.

If the chicks have been placed under a circular hover, a muslin frame or pen of some sort should be placed around it, so that they cannot get more than a foot or two away from the hover during the first two or three days. It is highly important during these first days that the chicks be given no opportunity to get chilled, and that they learn where to go when they want to get warm. If an ordinary brooder is used, they should not be allowed in the outside chamber until after they are three days old.

Feeding the Chicks.—"Little and often" is the best general motto that you can adopt with reference to feeding baby chicks during the first few days of their lives. The newly hatched chick is a very tender and frail little creature, and must be treated as a baby. As has already been stated, the lives of thousands of these little fellows have undoubtedly been sacrificed on account of ignorance as to the best kinds of feed and the best methods of feeding. Some of the more common mistakes in feeding which have been made are: Feeding too soon after hatching, feeding too freely, feeding sloppy food, feeding too much corn, feeding commercial grit at the start instead of coarse sand, etc.

The First Feed.—Chicks should not be given their first meal until they are forty-eight to sixty hours old. The reason is this: Just before the chick is hatched it absorbs, or, to be more exact, takes into its body whole, the yolk of the egg which produced it. This yolk has sometimes been spoken of as "Nature's lunch-basket." It is intended by Nature for the little chick to live on until it is strong enough to shift for itself. It usually takes from forty-eight to sixty hours to digest this yolk; and if the chick is given something else to eat before that time, digestive disorders are liable to arise.

What to Feed.—Poultrymen are by no means a unit as to what should constitute the first few meals for baby chicks. Possibly it cannot be said that there is any one "best" feed. Yet, in a series of very careful experiments carried on, in which nearly all the methods in common use were given a thorough tryout, a mixture of rolled oats, hard boiled eggs and bran was found to give best results. The ration was mixed in the proportion of two parts rolled oats, one part egg and one part bran by measure, to which was added a small amount of charcoal. A small amount of this mixture was fed on a clean board or paper three times a day. Care was taken not to feed them more than they could clean up in ten or fifteen minutes, and the boards were taken out as soon as they were through eating, so that they would not become soiled with the droppings. Occasionally, in order to get the chicks started to eating the first time, it is necessary to tap the feed board repeatedly with the fingers. The little fellows are great imitators, and when a few of them get started to eating, the rest will soon follow suit. The above is used for the morning, noon and night feed, the rolled oats, egg and bran being fed three times a day, and a good grade of commercial chick feed is scattered in the litter between meals. This will induce the little fellows to exercise, and it will not be long until they will leave the bran, egg and oatmeal to dig after the seeds and grain in the litter. After they are two weeks old substitute dry mash for the oats, egg and bran, and feed the grain at morning, noon and night, and the dry mash between meals.

Grit.—Most of the grades of little chick grit which are on the market are too sharp for newly hatched chicks; for this reason good, clean, coarse sand is preferable for the first few days; a little of this sand is sprinkled on the feed-boards about the time the first feed is given; no grit of any kind is given prior to this time. Grit should be used sparingly and with care until after they are ten days old.

Water.—A never failing supply of pure water is vital to the welfare of young chicks. For the first few days the water should be given lukewarm, never cold. The water should be changed and the drinking vessel rinsed out three times a day, so as to avoid danger of disease as much as possible. The drinking vessel should be thoroughly scalded once a day. It should be so arranged that the chicks cannot get into it and cannot spill it into the litter in which they are scratching.

FEEDING GROWING STOCK

When the chicks have reached the age of six weeks we then place a dry mash before them, composed of 2 parts bran, 1 part shorts and 1 part corn meal. This is placed in a hopper. It is also a good idea to mix a little fine charcoal in this ground feed, also half a pound of fine salt to every 100 pounds of the mixture. This mash is used until they are fully matured. From the time the chicks are six weeks old until maturity you can feed them equal parts cracked corn and wheat, fed in hoppers. If you cannot furnish your chicks with the sour milk or buttermilk it may be necessary for you to add one-half part of high grade beef scraps to the dry mash if your chicks haven't free range and do not get a liberal supply of bugs and worms.

A SECRET IN FEEDING YOUNG CHICKS

In growing young stock it is very important that they be kept growing and at no time are allowed to become stunted for any reason whatever. They should be kept on fresh soil each season. If you are forced to use the same pens every year for the growing stock, see that the soil is made fresh and sweetened by cultivation and by growing some green food thereon.

There is one method of feeding chicks which should be practiced by every poultryman whose young stock is kept in limited quarters. If the chicks have free range and find plenty of bugs and worms it is not so important. But unless that is true, poultrymen can grow much better chicks, they keep in better health, and they develop faster where this feed is used in addition to their regular ration.

The feed is mixed as follows:

2 quarts bran.

1 quart shorts or middlings.

1 quart corn meal.

This is mixed as a dry mash. A large quantity of it can be mixed for a large flock, but it should be mixed in the above proportion. It can be mixed and stored in bins, sacks or hoppers and used just as needed.

Six quarts of the above mash are used in preparing this feed. With this is mixed one quart of ground lean meat. Any kind of cheap lean meat will answer for this purpose. It must not be tainted in any way. The one quart of meat and the six quarts of mash are thoroughly mixed. Then one pint to one quart of water is added. This mixture is thoroughly stirred until it is well mixed, after which it is run through a sausage mill or any other kind of mill that will produce similar results. The meat will be mixed with just enough of the mash that the chicks do not overeat and the results are surprisingly good. It will tend to keep the birds in good health, it will hasten their growth and add to their vigor. This is a cure for many ills in raising young stock.

Do not give all the birds will eat, although there is not much danger of causing serious trouble because of the amount of dry mash mixed with the meat scraps. You will find this a great aid in raising young stock and securing a satisfactory growth and development. It is worth a great deal to know this one secret. One prominent poultryman said this one fact was worth a trip across the continent to learn of it. Especially is this recommended for young chicks that have reached the age of a month or more.

Where chicks appear to be sleepy, lifeless, slow to feather, slow to grow or becoming light, I would advise the use of this mixture prepared and used as recommended above.

HOPPER FEEDING

Hopper feeding has many advantages, both in care of growing stock as well as with the older fowls. Where it is intended to use the hopper method in the laying houses there is a big advantage to be gained in growing the chicks by this method. We should, however, provide the proper style of hopper. It should be so constructed as to give protection in wet weather, permit the grains or mash to feed freely and be so arranged that its contents cannot be wasted or scattered over the ground by the chicks.

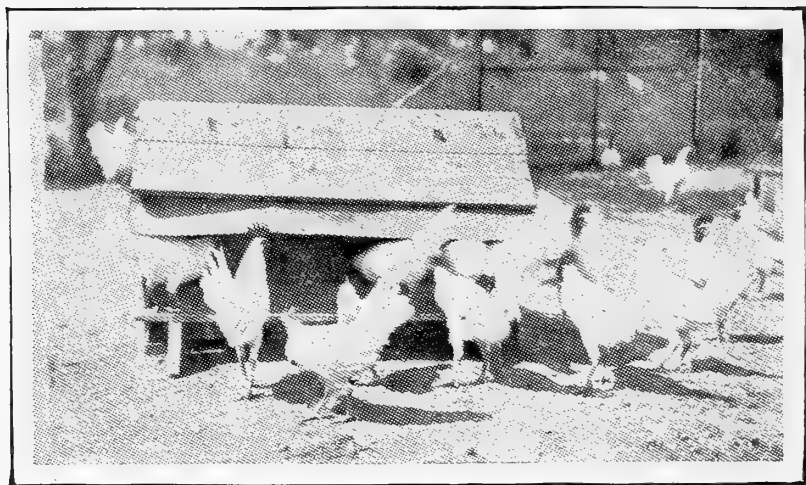


FIG. 22
A good home-made outdoor hopper.

The use of hoppers for feeding both grain and dry mash after the chicks are six weeks old is a good practice. By this time they are usually placed out on free range in coops or colony houses provided for that purpose. If you continue to feed the chicks by hand when you open the houses each morning to let them out, they will wait and follow you and beg you to feed them. They fill up on the grain or the feed you give them. They then sit around and wait until the noon feed, and just so at night again. The result is that they follow around after you every time you come in sight, and they are never satisfied or contented and do not hustle and get the exercise or develop as they should. But if you place all the feed in hoppers when you turn them out of the coops each morning they pay no more attention to you than if you were not there. They rush by you and on by the hoppers containing the feed and out into the clover and cornfield or orchard in search of worms, bugs, etc. They soon learn that the food is always there when they want it, and they also learn that the "early bird catches the worm" and they go in search of them first. Then they come back to the hopper and fill up on grain and dry mash. But if you hand-feed, unless you are an expert, the chicks fill up on your feed and then sit around in the shade of a tree until they see you coming in sight again. The chicks know much more about their wants than does the average inexperienced person who attempts to raise poultry. For this reason we think your results will be far more satisfactory if you feed the ration recommended above for growing stock, and feed it in a hopper and allow the chicks to help themselves after they are six weeks old. By actual test they do not eat any more where they are hopper-fed than where they are hand-fed.

Green Food.—Chicks do not need green food the first week—in fact, green feed given during the first few days is liable to cause bowel trouble; after the first week, however, green feed of some sort is indispensable to best results; without it the chicks do not make as good growth or put on weight as rapidly.

After spring is well advanced and the weather is mild and green grass is plentiful, there is no green food problem—Nature supplies it; but in winter and early spring green feed of some sort must be supplied.

A few pieces of thick sod thrown in where the chicks are each day both supplies green food and furnishes a valuable source of exercise. Sprouted oats is another valuable green food for little chicks. A very good plan to sprout the oats and furnish them to the chicks is to sprout them in shallow portable trays; when the oats are well sprouted, the

sprouts being about an inch and a half high, the tray containing them is placed in with the chicks; as soon as they learn what it is there will be a rush for these succulent morsels. As soon as the green sprouts have been picked off, or the chicks have had enough, the tray is taken out, and the oats allowed to sprout for two or three days more before it is put back again. In this way a single tray of sprouting oats can be used several times. By having several trays, this tender green feed can be provided daily.

In starting the chicks in on green feed great care should be used not to overdo the matter. They must get used to it gradually. They relish it greatly, and if allowed to eat all they want at first, bowel trouble will sometimes result.

KILL CRIPPLES AND WEAKLINGS

No matter how great care is taken in hatching chickens, and regardless of whether they are hatched with hens or in incubators, some of them will be crippled, undersized, or will show other unmistakable signs of constitutional weakness. These weak chicks should not be allowed to live. While this advice may seem entirely devoid of sentiment, yet it is prompted by the good old American doctrine of "the greatest good to the greatest number." Their presence jeopardizes the health of the rest of the chicks, for the weaklings are always the first to contract and spread disease.

As a matter of fact, to quickly do away with chicks which are crippled when hatched, or which show other signs of weakness, is the most humane and sensible thing which can be done to them. The chances are that they will just linger along and die in a few days or weeks at best. There is always a temptation to try to nurse along the cripples and weaklings; while they can sometimes be brought through to maturity, they will be of little value, and the time and labor expended in caring for them can be used to a far better advantage elsewhere. One of the big secrets of success with poultry is close and constant culling, and it should begin at the time the chicks are hatched.

MATURING THE CHICKENS

After the chicks are feathered out they are past what is commonly known as the "danger period"; yet, if best results are to be secured, they should not be required to "shift for themselves" entirely from this time until they are mature. To mature normally, they must be properly housed, properly fed, provided with proper range, guarded from natural enemies, and protected from the outbreaks of disease.

Housing Growing Stock.—A common mistake, and one which often results in stunted and otherwise malformed birds, is that of housing the growing stock with the mature stock. The result is that they pile up in the corners of the hen-house, become infested with lice, are beaten about and imposed upon until it is impossible for them to develop normally.

The ideal way of housing growing stock is by means of the double-room brooder house such as is illustrated in this lesson, or in movable colony houses, such as the Fool-proof Colony House described in the lesson on poultry-house construction. In these last mentioned houses not more than fifty head are kept together; the houses can be dragged out into the orchard, along the corn fields, etc., where ideal conditions obtain. These two systems of housing growing stock are the only ones which will give real satisfaction in the long run—especially where several hundred head of chicks are being raised each season.

Range for Growing Stock.—An abundance of free range is absolutely essential to the proper maturing of young stock. Birds matured under intensive conditions do not feather out properly, are lacking in constitutional vigor, and are generally unsatisfactory. Of course there are apparent exceptions to this rule, but they are "few and far between." Prize-winning birds have been hatched and reared in back-yards, but their raising entailed much more time, labor, and expense than if they had been raised under normal conditions.

Ideal range for growing stock is well drained and provides both natural shade and an abundance of green feed. Corn fields furnish almost

ideal range conditions; insect life abounds, the growing corn furnishes a semi-shaded condition, and there is usually plenty of green feed. Birds matured under such conditions usually come up in the fall, red-combed, husky and vigorous, ready to excel in show room or laying house.

Feed for Growing Stock.—Growing stock should never be allowed to get very hungry. It is a case of being "penny wise and pound foolish" to try to compel the chicks to rustle for all of their living. To make a maximum growth and put on the largest amount of weight, the organs of digestion must be kept busy twenty-four hours a day. If you do not know how to hand-feed your chicks use hoppers with grain on one side and dry mash on the other.

FEEDING FROM START TO FINISH

The method of feeding, which is used quite extensively, is as follows:

FIRST DAY

"Yolk in body supplies food. Do not feed.

FIRST WEEK

"Boiled eggs cut fine, bread crumbs and oatmeal, equal parts. Feed in form of mash on clean board, all they will eat in 20 minutes, five times per day.

"Give sour milk each forenoon and water in afternoon.

"Keep fine grit or sand before them.

ONE TO FIVE WEEKS

"Equal parts wheat bran, shorts, oatmeal and corn meal.

"Use as a mash in hopper and give good grade of commercial chick feed in litter.

"Two pounds fine charcoal and one-half pound fine salt should be added to each hundred pounds mash.

"Sour milk or water should be before birds at all times.

FIVE WEEKS TO MATURITY

"One part ground oats, 1 part shorts, 1 part wheat bran, 1 part corn meal, $\frac{1}{2}$ part beef scraps, $\frac{1}{4}$ part bone meal.

"Use this as mash in hopper, and give equal parts cracked corn and wheat in litter, all they will clean up in thirty minutes, twice each day. Fresh water and grit should be before them at all times. Free range should be provided."

Very complete details of feed, care and methods of handling day-old chicks will be found in Lessons 14 and 15, "The Baby Chick."

AS OTHERS SEE THE BROODING PROBLEM

Prof. H. R. Lewis of the New Jersey Experiment Station, who is now on the advisory faculty of this School, makes certain valuable suggestions as to practices in brooding, which it might be well for us to quote at this time:

"In order to get the chicks in condition for removal to the range it is necessary after the second week to practice a hardening off process. This should be gradual and consist of lowering the temperature with the idea of doing away with artificial heat entirely in from three to six weeks, depending upon outside weather conditions. The best practice is to reduce the artificial heat until it can be entirely given up, then gradually to raise the hover until it can be removed and replaced with muslin-covered frames, having them hung to the hover wall, gradually raising them in front a little each night until the chicks become used to their absence. It is impracticable to take them from a warm-heated brooder house and put them into a colony house unless they have been accustomed gradually to the change. The idea should be to get them on the range as soon as possible. When they are four weeks of age, the sooner they can be gotten out into the cool temperature in large, well ventilated quarters with free range and abundance of green food and access to the ground the better they will grow, and the hardier and more vigorous will they be at maturity.

"This hardening off process is especially desirable with Leghorns, as

their close feathering makes them susceptible to cold weather, and when not properly weaned they pile up on one another to keep warm. This usually results in the death of many and a loss of vitality to the others. The most of the losses in brooding young chicks are due to following causes:

"1. Crowding and subsequent death, caused directly by a too low brooder temperature.

"2. A derangement of the digestive systems resulting in diarrhea, and usually caused by wet, sloppy, early feeds.

"3. A loss of vitality and stamina, due to overheating.

"4. The tendency which chicks, especially Leghorns, have of devouring one another. It is commonly called cannibalism, develops chiefly in large flocks, and is due to an insufficient amount of animal material in the ration. The remedy should be to remove all birds which have been attacked or any which show signs of blood. A dry mash composed of equal parts of meat scrap, dry ground bone, oyster shell and wheat bran should be provided in an open dish. This will correct the ration, and with care the habit can be stopped.

"5. A contagious disease known as white diarrhea. Where the chicks are carried off during their early growth in large numbers, it is often caused by an infection which may be inherited by the young chicks, the disease in its chronic form being found in the ovaries of their mother. The best way in such a case is to completely disinfect the brooding quarters and provide the chicks with an abundance of sour milk to drink. The germs of white diarrhea are easily killed in a dilute acid. The only way to avoid future epidemics is to trap-nest all hens and find out which are infected. They should be killed when detected.

GROWING PERIOD

"After the chicks are weaned and placed on the range, the aim should be to induce a continuous growth throughout the summer. By avoiding any checks, or set-backs, due to improper feeding or care, they will mature more quickly and more uniformly. There are three factors which affect the growth of the chick after weaning—(a) inherited characteristics; (b) environment; and (c) food supply.

"The undesirable inherited characteristics which are the most pronounced are loss of stamina, due to breeding the adult birds which lack this requisite, and also small size and slow growth, which are usually caused by breeding from pullets rather than from mature hens. The size of the chicken at maturity is in direct proportion to its size and weight at hatching time, and hence the pullets laying small eggs, which produce smaller chicks when used as breeders, cause deterioration. The rapidity of growth, the feathering, and the ability to forage are largely inherited characteristics, varying with the different breeds. They must be given due consideration in outlining the management which is to be followed.

"Environment plays an important part, as the best bred chick, possessing all other desirable characteristics, if not given ideal conditions in which to grow, will not be allowed to exercise or develop inherited traits. These conditions are as follows:

"1. One should not attempt to grow young stock on restricted range, for it will not make a satisfactory growth, due to limited supply of green food and lack of exercise. Free range conditions should be provided, and extensive rather than intensive methods should be followed.

"2. Shade should be provided in abundance. Trees are ideal for this purpose, orchards being especially desirable. If trees are not available, corn or sunflower seeds can be planted, and, in the absence of either of these, artificial shelters of burlap over wooden frames should be provided.

"3. An abundance of green, succulent food material is very necessary. If free range conditions are provided, this will be found in abundance. Where it is necessary to grow a large number of chicks on a limited area, the plot of land should be divided into two parts, colony houses being placed approximately through the center of the field and a portable fence placed on one side of the house, and later moved to the other side.

This will permit rotating the two areas and growing desirable crops to supply succulence. Peas and oats can be sown early in the spring, followed by rape and later by buckwheat. In the fall wheat, rye, vetch and clover, any, or all, can be sown to provide a winter cover crop and furnish early greens.

"4. The type and size of the house in which the chicks are placed bears a close relation to their growth. Fresh air is the limiting factor. The chicks are only in the house or shelter during the night, and all they need is protection from wet weather and enemies. An ideal summer growing house is one about 6 x 8 feet on the ground with a shed roof, the front being 6 feet high and the back 4 feet. The door can be placed in the center of the front, with a long, narrow muslin opening on either side of the door. The lower half of each side wall should be made in the form of a panel, hinging at the top to allow it to be opened out and up. When these two sides are opened, a free circulation of air through the house keeps the birds cool and comfortable on warm nights."

RELIABLE REMEDY FOR WORMS

Round worms are intestinal parasites of poultry that are causing an enormous annual loss to poultrymen from decreased egg production and high percentage of mortality in the flocks. The symptoms of round worm infection are dry, pale comb, ruffled feathers, emaciation, going light, and the presence of worms in the intestines.

Many of our students use and recommend the tobacco treatment for intestinal worms. We have used it with very satisfactory results. This treatment is 2 per cent by weight of powdered tobacco dust in the wet or dry mash for three weeks, that is, use 2 lbs. of powdered tobacco dust to each 100 lbs. of dry mash. The fowls do not seem to mind the taste and eat as much as ever. This is given to the pullets when put in laying house and we are never troubled again.

Experiments demonstrated that tobacco dust fed in the dry mash is an effective remedy for round worms. No harmful effects on the birds have been found. Its use has caused no decrease whatever in the egg yield of the flocks. On the contrary, an immediate and constant improvement in the condition of the infected birds has resulted in increased egg yield. The birds do not seem to detect the presence of tobacco dust in the mash, and therefore relish it and consume their usual quantity without the necessity of applying starvation measures. The use of tobacco dust is recommended in flocks that are known to have round worms.

Tobacco dust should be fed in the mash daily for a period of at least six weeks in the proportion of 2 per cent by weight, or two pounds of the tobacco dust to each 100 lbs. of the ground feed.

And not only is tobacco dust effective where fowls are known to be infested with worms already, but successful poultrymen use it as a preventive. They begin on chickens three months old, giving one pound to each thousand birds daily for three months, mixing it in the dry mash.

Poultry supply dealers and seedsmen have the powdered tobacco. Poultrymen wishing to try this remedy should be sure to get ground tobacco and not ground tobacco stems.

CHAPTER II

TELLING THE SEX OF EGGS BEFORE INCUBATION AND OF DAY-OLD CHICKS

Copyrighted March 1921

By NODA FRY

My first hen was a White Bantam, presented to me by a relative when I was five or six years old. From that day to this I have been a constant student of the poultry business.

In working out this problem of telling the sex of eggs and chicks I have at times been so intensely interested that I have arisen at two, three or four o'clock in the morning and candled eggs, examined air-cells, removed my baby chicks from incubators that were hatching, and while the rest of my family were sleeping I worked out the problems which I am revealing for the first time in this book.

But, to go back to the little bantam hen, how happy I was to think that I really owned this hen. The sun seemed to shine brighter and the world in general held a great deal for me. I hopped first on one foot and then on the other. I stroked her feathers, patted and caressed her daily. At each meal time she got the table scraps, all she could eat and more. I gave her sweet milk to drink as often as I had it for myself, but bless you, I never got a single egg. After two years of this kind of care she died, but to save me I never could tell whether she starved or foundered. Just the same, however, I was heart broken, for this hen meant as much to me as an entire flock does now.

My next venture was with Brown Leghorns. My mother allowed my sister to set a hen at the same time that I set my first one. My sister's hatched ten chicks and mine hatched twelve, but I was forced to give up one of my little brown fluffy chicks so that my sister and I would have an equal number. The June sun soon got both bunches. This left me bankrupt in the chicken business for the second time. I did not try poultry again very soon, but I always had a love for it and a desire to get back to the poultry yard.

I had by this time grown to be quite a girl and was forced to go and spend some time in college and then in a university. While there I had an opportunity to choose between a man of wealth as my future companion, and perhaps forget about the poultry business, or else leave my home in Dixie and come to Missouri and accept an humble mountain home in the Ozarks, where I might have a chance to develop my poultry business. I chose the latter and here I am.

I decided to raise a bunch of Brown Leghorns. I got them hatched all right, and I managed to raise a goodly portion of the number by carrying a coop to fresh ground each day and by taking them away from the larger fowls around the house and placing the coop in the oat field.

But to my amazement, in due time they all developed a fine comb and sword feathers and began to crow! I did not want a bunch of cockerels, so I tied their feet together, got on a horse, and took them off to a neighbor, who traded me some Barred Rock pullets for them. Any kind of pullets, I thought, were better than none, but by frost they were big, heavy hens, practically all proving to be non-layers and too clumsy to get on the perches when night came. They stalked after me until I put them to roost. Every evening brought the same old task. They couldn't learn. So that poultry venture was not very profitable.

I next decided to teach school for awhile. This I did for a time. While I liked the work, I did not like the wage, so finally I returned again to my own realm, the poultry business, and here I am to stay. Ever since I have been running Grand View Poultry Farm. I have been engaged in

the business ever since, with the exception of a few months which I spent in California studying the poultry business.

While there I made another investment in poultry, buying a mixed bunch of no particular description. I gave them the best of feed, the best of care and attention, and I kept crushed barley and ground mash before them at all times. They laid well and in seven weeks' time paid for themselves. I do not know of any other business in which I could engage and in which I could double my money in seven weeks, but when I came home to my beautiful White Leghorns they gave me a very hearty welcome and I was glad to get back to my own farm, where I took up again the study of the sex of the egg and the chick.

A LIVING FROM POULTRY

Who said they could make a living from poultry? I said it, and repeat it. It is possible for an energetic man or woman to not only make a living, but a small fortune, if the business is rightly engaged in.

Now I am not intimating that any one who sits with folded hands can even make a profit in the business. It isn't a lazy man's job. You must **know how**. You should study the business and adopt the latest and most modern methods. No, my dear reader, idle hands never made any one a living. The best river-bottom farm in our fair land would be as useless as a desert to a person not willing to earn a living by the sweat of his brow.

You may ask, "How large a farm is necessary?" It depends on how large a poultry proposition you are going to establish. The one I have in mind is only a few acres in area. It is not necessary to erect expensive houses or use expensive equipment, but it is necessary to see that these are of the proper type, that they are properly located, and that the quarters are comfortable and productive to the good health of your fowls and convenient and labor-saving for your own good. If you use such well known methods as are taught by this School I see no reason why you should not make a living and a good profit from the poultry business.

MY FIRST EXPERIENCE WITH AN INCUBATOR

My first incubator was a good 130-egg, hot water machine, but the one who wrote the directions that came with it had surely never been in sight of the nest of a sitting hen, nor looked inside of any other incubator when running, nor studied the principles of incubation.

I read his book and tried to follow his directions to the dot. That was some test! I stood each egg on the small end and saw that it stayed that way. When I counted my eggs I found that I had 163 in that one machine. By forcing them to stay in that position in the egg trays I, of course, knocked off a good many during incubation and was continually mopping up broken eggs from my floor, but that was not the worst of it. When they hatched I had 13 cripples that had to be killed, and a great many dead in the shell. All told there were 73 chicks able to walk, and I finally lost most of these.

But undaunted I set it again and again, each time getting too many cockerels and too many dead in the shell. I finally overcame this latter trouble and found, in my case, that it was a lack of moisture. This I soon learned to control. By and by I found that I could get a chick from practically every fertile egg in my machines, whether hen eggs, duck eggs, or turkey eggs, and I hatched one quail in my incubator.

MY PREMIUM HATCH

In May of that year I was able to get my first perfect hatch. I set 163 eggs in a 160-egg incubator. On the twenty-first day the last of the hatch came off—163 chicks. I had made a record hatch. For this I was awarded a \$20 gold piece from the company which manufactures the incubator, but I had to use a lot of good common sense in selecting my eggs, in turning and cooling them, in regulating the moisture and seeing that my incubator room was supplied with an abundance of fresh air. I advise you to follow the directions sent with your machine and if you cannot get satisfactory hatches by doing that, then you had better change your method and use a little of your own common sense.



My premium hatch—163 chicks from 163 eggs.

TELLING THE SEX OF AN EGG BEFORE INCUBATION

I have been working on this proposition for several years. I have proven the test to my entire satisfaction, and for the past two seasons have selected all of my eggs for incubation and my chicks which hatch from them according to the methods which I now recommend to you. I tried to interest Mr. T. E. Quisenberry, President of the American Poultry School, in my method of telling the sex of an egg, but he stated that all such propositions that had been submitted to him to date along this line had proven that they were fakes when really put to the test, so he paid practically no attention to my first appeal to him to try out my method.

I was so persistent, however, that he finally consented for me to send him fifty eggs that I had selected as cockerels and fifty that I had selected as pullets. I also shipped him fifty chicks that had been selected as cockerels as soon as they were hatched and fifty that I selected as pullets. He hatched the eggs in his own machine and brooded the chicks that I had shipped him. There was only one out of the entire lot that did not prove to be just what I said it would be. That did much to convince him that my methods were all that I claim for them, yet he was still not satisfied, so he came to my place and went over the tests with me thoroughly in person. He was still not convinced and was afraid to offer the method to the public until he had selected some eggs and chicks himself, and hatched them after making his own selection. This he did, and this book is the result.

I worked on this method, making different tests for a long time, and about two years before I ever mentioned it to the public I set one of my faithful old hens on seventeen eggs and hatched seventeen chicks. When they grew up old enough to tell the sex of the chicks every one proved to be a pullet, just what I had selected the eggs for. That was the first hatch that I had which proved to my entire satisfaction that I had finally discovered the great secret which I had worked so faithfully on and which the poultry world had been dreaming of. I had discovered a method of telling the sex of an egg.

My next venture was to select two sittings of eggs that would produce

cockerels. These were hatched out so late in the season that weather conditions were such that I lost all but seven of them. These proved true to sex as I had predicted, every one having sickle feathers, every one crowing, and each proving to be a male.

My third test was for more pullets. I hatched off ninety-six chicks this time and ninety-two of these were pullets, there being only four cockerels in the entire lot. Fried chicken was beginning to become a rather scarce article at our place. Every time a hen was set from that time on, and every time that I have set my incubator in the past two years, I have hatched whichever I wanted, cockerels or pullets, selecting the eggs at the time the eggs were set.



PULLET EGGS

These eggs showing the air-cell to one side of the egg, will all hatch pullets. Select eggs that are medium in size. If you are in doubt, don't set the eggs unless you are short of hatching eggs.

SELECTING EGGS TO HATCH PULLETS

Every poultry raiser in this broad land of ours is interested in raising pullets, more pullets, and better pullets, but how to obtain more pullets seems to have been a mystery in the past that no longer need be a mystery from now on. It is possible to raise practically all pullets or all cockerels, whichever you desire.

In order to hatch all pullets select medium-sized, smooth eggs, with the air-cell located to one side near the large end of the egg. This is no guessing game, but it is a **SURE THING**. To select these eggs it is necessary to use a candler. Do the candling either in a darkened room or at night. Use a good candler before a strong light. An ordinary egg tester that comes with an incubator will answer.

A great many eggs I find are uncertain as to sex, showing the air-cell too near the center of the large end of the egg to distinguish whether it is a pullet or a cockerel. These I market because I cannot afford to take chances when hatching chicks. This same test holds true with any breed or variety.

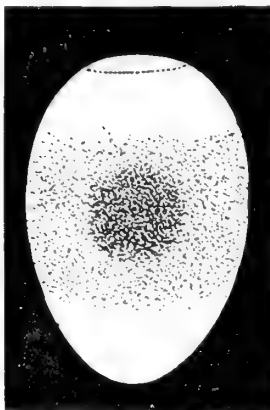
In testing these pullet eggs the cell cannot be seen from the opposite side of the egg at all. You can easily see the air-cell when the egg is held in position before the candler so that the air-cell shows on either side of the egg or when directly toward you. If you cannot at first distinguish the cell as soon as the egg is held before the candler, revolve it slowly and you can very soon locate the air-cell. You will usually either find it on the side, indicating that the egg will hatch a pullet, or you will find it squarely in the large end of the egg.

Do not select very small eggs of either sex, as they produce weak

chicks, which usually live only a few weeks and at best are a continuous menace to your flock. If raised, they will be unfit as breeders. Such eggs seldom hatch chicks that actually pay for the cost and labor of raising them.

COCKEREL EGGS

This shows the air-cell of the egg squarely in the large end. Such eggs as this hatch cockerels. If you are in doubt about the sex of the egg and you want largely pullets, don't set the egg unless it is from a valuable hen. Remember that eggs that test like this hatch cockerels. Select large eggs.



SELECTING EGGS TO HATCH COCKERELS

To produce cockerels select eggs of large size, long in shape, having the air-cell located squarely in the center of the large end of the egg. Locate the cell by means of a candling device, the same as is used for selecting eggs to produce pullets. This candler will show the cell the same from one side of the egg as from the other; no matter in which direction you revolve the egg before the candle the air-cell will always be in sight at the top.

While cockerels are not so greatly desired as pullets it would be well to remember that the male is one-half of the breeding pen. Therefore you had better select good, strong birds of either sex. Select all eggs for setting from among eggs laid by the heavy layers.

In selecting eggs from which to hatch cockerels select large eggs, as they are the only kind that will produce good breeders or good market birds. You will find that they will be large chicks when hatched, will grow quickly, and will be good sized birds when matured. If you select such eggs as I have mentioned above, these never fail to produce cockerels.

To enable you to tell the sex of eggs place the candler around or in front of some strong light, or around an electric light bulb. Hold the egg in front of the opening in the front of the candling device. The air-cell will appear as a light brown spot within the egg. The air-cells are usually found in the large end of the egg, or near that point. A very small per cent of the eggs laid have the air-cell in the small end of the egg. These are unfit for setting, as the chick's head is always formed in the end containing the air-cell. Therefore, when the chick's head is in the small end of the egg it seldom has room to pick its way out of the shell. It often picks the shell slightly and then dies.

In some tests which were made at the Missouri Experiment Station it was found that a comparatively small per cent of chicks develop with the head resting in the small end of the egg, and it is best to eliminate all such if possible.

You will find, as a rule, that in hatching an incubator bunch of chicks that the first to come out are males, the second period of the hatch are largely pullets, and those that linger longest in the shell are the weaklings of the whole flock. This will, of course, vary some, but holds true to a large degree.

NON-HATCHABLE EGGS

There are certain eggs that positively will not hatch. After an egg has been laid for any length of time, or has been put in the incubator and incubation has started, if there is any sign of an air-cell anywhere in the egg, you will find that such an egg will never hatch, even though it may be fertilized. The embryo will die in the shell if it is fertile.

I have never been able to tell just why it is that an egg with an air-cell on the side will hatch a pullet and one with the air-cell squarely in the top will hatch a cockerel and why such eggs as I have just mentioned will not hatch at all, but I believe that there is a good reason for it and as we go further into the proposition that we will find it logical and easily explained. But I do know that an egg which has no air-cell, whether fertile or non-fertile, positively will not hatch. In candling eggs for setting, no matter how perfect an egg might appear from the surface, if there are no visible signs of an air-cell when the egg is placed before the candling device I would advise you to market it.

TELLING THE SEX OF THE DAY-OLD CHICK

To tell the sex of day-old chicks catch the chick with the hand over the back and as you lift it clasp the thumb and finger firmly at the base of the skull just where the neck and head join. Let the body of the chick swing free, with the base of the head resting between the thumb and finger.

If the chick is a female it will flop its wings and draw its feet upwards.



A female. Hold the chick by the head in this manner. If it struggles with feet and wings it is a pullet. If in doubt, let it rest a minute and test a second time.

If it is a cockerel its feet will hang limp from the body. A cockerel may struggle a trifle, but as a rule they will usually straighten out with their feet hanging limp.



A male. Hold the chick in this manner. If it is a male it will straighten out or feet hang limp. May struggle a little at first, then hang limp. If in doubt test a second time.

This is true with any breed of chickens. Just why a pullet will hold her feet up, or a cockerel will hang his down, I do not know. I only know that they do this. This secret is something new, AND DEPEND-ABLE. If you are in doubt when you make your first test let the chicks remain quiet for awhile and test them the second time. After you have had a little experience in testing either the eggs before incubation, or the chicks as soon as they are hatched you will soon become an expert.

JUNE HATCHED CHICKS

Some people say that it is a waste of time, eggs and money to hatch chicks in June. but this all depends upon the vigor of your stock, the



"June"

amount of tender green food that you give your youngsters, and the methods which you employ in raising same.

The above beautiful, thoroughbred Holstein heifer was purchased by me from the profits which I made from two hundred White Leghorn chicks, which I hatched during the month of June. For that reason I named this beautiful Holstein heifer "June," and this shows what can be done where the right methods are employed.

But you must remember that in the early spring months your breeding stock is filled with vigor, the chicks have more tender green feed, and they get more bugs and worms in the early spring than they do in the hot month of June, so you must provide all of these things for your chicks, you must see that water is constantly before them, and you must provide shade to protect them from the hot summer sun.



MRS. FRY'S METHOD OF SELECTING THE LAYERS AND NON-PRODUCERS AT SIGHT

There are two classes of poultry, as far as good producers are concerned, which I class as "broad-gauged" birds and "narrow-gauged" birds.

A broad-gauged bird is a good producer. They are broad across the back at the base of the wing. They are broad across the back at the base of the tail. They are broad and deep in the abdomen and widespread between the legs. Such birds have large capacity for the consumption of food and for the production of eggs. They are good producers.

The narrow-gauged birds are narrow and lacking in all the points that I have mentioned above. They haven't the capacity and are therefore not good producers.



The narrow-gauged hen on the left is of low vitality. The hen on the right is of high vitality, broad-gauged, a good layer and of large capacity.



A narrow-gauged hen on the left. A broad-gauged hen on the right.



A poor layer is narrow at the base of the wings. A good layer is broad at base of wings.



A hen narrow at the base of the tail is a poor layer. A good layer is broad across back and at base of tail.



A poor layer has a small comb. A good layer has a rather large comb.



A narrow-gauged, poor layer is narrow in the abdomen. A good layer is broad in the abdomen. She is a broad-gauged hen and broad between the legs.



A narrow-gauged male is narrow across the shoulders. A good producer of high layers is broad at base of wings.



A narrow-gauged male is narrow at the base of tail. A broad-gauged male is broad at this same point.



The male on the left is narrow and lacks capacity. The male on the right is broad across the back and has lots of capacity.



The poor producer and narrow-gauged bird is narrow between the legs. The broad-gauged, good producer is broad between the legs and across the abdomen.

Capacity

Capacity means the feed basket which each fowl carries around within its own body. This basket seems to be suited to the needs of the possessor, the small feed basket belonging to the narrow-gauged bird and the large feed basket belonging to the broad-gauged bird.

Some greedy feeders carry a saggy basket, perhaps made so by the weight of the extra fat which they carry and whose digestive system produces fat instead of eggs.

The small feed basket, as I said before, belongs to the narrow-gauged fowl and does not contain enough material to produce a great many eggs, its owner being a light eater and a still lighter layer. Thus you see the broad-gauged fowl does the bulk of the laying and should be the only fowl used for breeding. The facts are that they are the only fowls which can pay their feed bills. A broad-gauged hen is capable of returning to her owner, in ordinary times, about \$2.50 for each \$1.00 spent for feed. This has been proven by others as well as by myself.

Look well to the health certificate of the hen. This you will find located on the top of her head—more commonly called the comb. In

good health this comb seems plump and red. In poor health it becomes less reddish in color, sometimes being purplish or yellowish, and, as a rule, seems more or less limp and limber or shriveled if the fowl is of low vitality or in poor health.

If given free range a fowl has a pretty good chance to regulate her own health. If able to obtain green feed and a certain amount of meat (bugs and worms), also plenty of grit, the hen will usually balance up her own ration.

THE CHICKEN HAWK

This pestiferous little bird, covered with a good coat of fluffy feathers and provided with a pair of swift wings which are strong enough to bear his little body away from the danger of gunshot at a moment's warning, is a very troublesome pest in many neighborhoods. The hawk pounces down on the young or growing chicks without a moment's notice and is gone again with his prey. His claws are long, sharp and powerful and his beak is curved so that he can tear the body of the helpless chick and devour it in a short while.

Some farmers claim that they would not raise white chickens because there is more danger of hawks getting them than there would be if they raised some brown, barred or dark colored bird. This is not the case, however. If the eyes of the hawk are so piercing that they can see a mouse on the ground as they fly far above the ground, they could certainly see a chicken, no matter what its color might be. If the farmer's flock is composed of white chickens and dark chickens, all mixed together, the probabilities are that the hawk might take the white chicken before it would the others, but we doubt even that statement.

Most farmers are well acquainted with the shrill cry of the hawk, which he delights to send forth and which invariably frightens every fowl in the barnyard. The hawk is the most hated of all fowls of the air—hated by every living fowl, both wild and tame, and despised by every farmer the wide world over. Even the ordinary cur chases him away. Yet, despite these enemies, he returns to your very door to appease his chicken-craving appetite by carrying off one of your choicest fowls.

He is hatched out with a craving for chicken and is never satisfied unless his detestable little crop is filled near to bursting with chicken. As I write these words I am compelled to cease and give chase to an abominable chicken hawk which is trying at this very moment to catch one of my fine White Leghorn pullets which is nearly grown.

I once placed a pair of baby hawks just three days old in a box with some chickens of the same age. They instantly pounced upon the poor, defenseless little chicks and began eating them alive. I was forced to behead the hawks, and I experimented no longer with them.

When I first began raising chickens on my present location in the Ozark Mountains hawks were so numerous that I have seen three in sight at one time. For several weeks some of us were forced to carry a loaded gun and herd our baby chicks more or less of the time. As time went on I finally had a covered lot or park built, and in this I could enclose some of my growing youngsters for safekeeping. In the years that followed I kept trying to find some method of preventing the awful loss that farmers were having in sections where hawks seemed to be most plentiful.

I finally tried poisoning them. This proved more successful than any plan ever used before, as I destroyed nine of them the first year, the cost of the poison used being only twenty cents.

The method I give to you here as I used it, but as it is poison I caution you about the use of it.

TO KILL HAWKS

Give one level teaspoonful of Nux Vomica to forty one-half pound chicks. Do not use so much for baby chicks. Give once a week in mash. Do not eat a chicken that has been fed Nux Vomica until four weeks after last dose has been given. Keep this drug away from children. The hawk, you understand, has to eat the chick before he gets the dose of medicine intended for him, but rest assured that should he get a good

feed of it he will never trouble you again. This remedy is not only a sure enough hawk killer, but it is a tonic for your baby chicks as well. I have used this preventative and can recommend it.

WINTER EGGS AND HOW TO OBTAIN THEM

One winter egg is usually worth about three summer eggs. It therefore behooves us to strive to obtain winter eggs. Feed and water are only two of the essentials necessary in producing winter eggs. Give the hens a good warm drink the first thing in the morning. Keep plenty of dry mash before them. I would recommend feeding very much after the manner recommended by Mr. Quisenberry, of the American Poultry School, in his book on "The Science of Feeding." In addition to this give the table scraps and dishwater, into which put a teaspoonful of salt to the gallon of water. About every third morning add a tablespoonful of equal parts of ground mustard, ginger and cayenne pepper, mixed to a gallon of drinking water. There seems to be something beneficial in the soapy, greasy dishwater which seems to keep the fowls in good health and induces egg production, as well as the other ingredients which I have mentioned. At noon give a tender, succulent green food of some sort, all that you can get them to eat. In the winter time, about 3 P. M., give them all the corn on the cob they will eat before dark. You must use either buttermilk or beef scraps in the mash, as a substitute for bugs and worms which the hens have access to in summer months.

When forcing egg production it is also necessary to supply material for the production of egg shells. I use oyster-shell grit, or about five pounds of fine bone meal, to every one hundred pounds of ground feed. Some of my friends say they never provide anything for the manufacture of egg shells. Upon investigation I usually find that they are either getting only a very few eggs, or their hens are laying soft-shelled eggs or thin-shelled eggs that are easily broken and not fit to market. With the other feeds which I have mentioned a very good mash can be made from millrun, bran and crushed barley in equal parts. In case either of the ingredients are not to be had I use the other with good results.



Trough in which I feed moist mashes, dishwater, green food, etc.

FEEDING MOIST MASHES

The above shows a picture of the Fry family and their mountain home in the Ozarks. You can also see a trough from which a portion of my large flock of White Leghorns are eating moist mash. The arrow in the picture points to the trough. This trough can be used in which to

feed moist mash,es, tender green feeds, used to contain the dishwater which has been treated as I have recommended, or used in which to feed moistened mash,es or other foods that are being used to force egg production. A few little troughs like this about your poultry yard are more or less inexpensive, yet they are very convenient and prevent you placing the food for the birds on the bare ground where it will be more or less contaminated by filth of different kinds.

THE NEW FRY-MODEL HEN HOUSE

I believe that I have designed a house that will absolutely insure the good health of the fowls and at the same time give you more capacity



The New Fry-Model Hen House.

and prove to be a cheaper and better house than is ordinarily built for the money. You will see an outside view of the south end of the house as shown in the illustration herewith.

The dimensions of the house are 20 x 20 feet. The side walls are four feet high, with a row of twenty nests 12 inches high, 12 inches deep, and 11 inches wide. These are built on the outside of the house and are shown where the arrow is pointing to same in the illustration of the Fry-House. The edges of the nest project four inches into the room and eight inches out under the eaves and are three feet from the ground.

Two droppings boards 77 inches wide extend from the north to the south end of the building, leaving a two-foot walkway all around the walls of the room with an aisle three feet wide through the center of the house from north to south.

The perches are made from 2 x 2-inch pieces and extend lengthwise of the droppings boards, running from the north to the south. The perches hang from the ceiling and are kept in place by being fastened into grooves. The perches are ten inches above the droppings boards.

Three feet above the perches is a loft which can be filled with straw or leaves in the fall. This loft is made of four-inch boards laid one inch apart and covered six inches deep with leaves or straw. Even with the eaves in the north is an eight-inch opening filled with a shutter which is kept open in summer months. In the south end there are three ventilators, one 24 x 30 inches in the gable and above the loft, and one 24 x 24 inches on each side of the door directly above each two half windows.

I use four-light windows, 16 x 20, using two in each end and two in each side of the house. The two on each side of the house are only one foot above the floor. These being below the droppings boards provide

light for the 400 square feet of scratching floor from the earliest peep of dawn which heralds the coming of the great "King of Day" until we see the last glimpse of his smiling visage in the West. This house provides the hens with room for much exercise and therefore helps to keep them in good health and to increase egg production.

In some sections a dirt floor can be used, but in other sections I would recommend a tight board floor built over a solid concrete foundation.





"I Made over \$2000⁰⁰ With My Hens

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Tecumseh, Kansas.

Dear Mr. Quisenberry:—
I made over \$2,000.00 last year. I surely have been successful with poultry since becoming a student of your school. Three years ago I knew absolutely nothing about culling, feeding for egg production, fertilizing eggs, or housing. Now I am capable of handling a flock of any size successfully.

We realize more clear profit from our Leghorns than from any one grain crop, or the live stock, raised on our 400-acre farm.

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Mrs. H. A. Hume.

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**T. E. Quisenberry,
American Poultry School
Dept. Kansas City, Mo.**

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\$2,000 from eggs alone! That's what Mrs. Hume made just as a side-line. Now she is making poultry raising her real business. This is above the average, but you should do as well. You can make bigger profits the year 'round. It is sure and easy if you follow my secrets and practical methods.

Right NOW—Today—is the Time to Start Making More Profit from Your Poultry.

Profits from poultry, to those who know how, are bigger than ever before. Eggs this winter brought highest prices in history; they will be sky high this fall; feed is much lower; know how to feed the cheaper grains and still get wonderful big egg yield, when eggs are highest. Get your full share of the enormous profits in poultry. I can show you how, just as I have shown more than 37,000 others in 48 states and 19 foreign countries. Send for my free 100 page book NOW.

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MAY 23 1924

GET A REAL EGG TESTER

Success or failure in testing eggs for setting depends on having a tester that enables you to see what is inside the eggs. Here are some real testers.

THE GRANT DAYLIGHT CANDLER

As the name indicates, needs no dark-room. It is the most convenient and rapid candler made. Get highest prices by carefully candling and grading eggs before marketing. Don't break the law by selling bad eggs. You lose private egg customers by selling them one bad egg. Can be had with either 1 or 2 holes. Price, electric, complete with adjustable stand,

\$7.75

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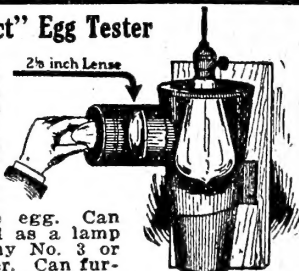
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For use in culling market eggs or testing during incubation.



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